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The Segments of the Lungs from the Standpoint of Surgical Procedures*

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The interlobar fissures divide the lungs into five lobes, three on the right, two on the left. The distribution of the bronchi and the arrangements of the blood vessels in the five lobes delineated by surface markings, make it desirable, however, for the surgeon to consider the lungs in terms of eight major structural units.

The Major Surgical Divisions of the Lungs: The lower lobes are made up of two parts, each division has a separate bronchus and blood supply suitable for surgical ligation. The superior or apical portions of the lower lobes are designated as the dorsal divisions, the inferior parts of the lobes, the basal divisions. The middle lobe on the right and its counterpart, the lingula of the left upper lobe, have similar anatomic properties. The two upper lobes complete the eight major surgical units of the lungs. All of these divisions are fairly constant and it was suggested by Nelson¹ in 1934, that it would be proper to consider the lungs to be made up of eight lobes instead of five.

The Minor Surgical Units of the Lungs: The bronchial distribution in all of the eight major divisions except the dorsal divisions of the lower lobes form smaller units or segments which may be the site of localized disease. In selected cases, one or more segments may be removed separately if surgical extirpation of the lesion is desirable.

The basal divisions of the lower lobes are usually divided into four, more or less constant segments: The anterolateral segments, the posterolateral segments and the anteromedial and posteromedial segments.

The middle lobes (the lingula of the left upper lobe is considered

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the left middle lobe) have two segments. The segments of the lingula, namely, the anterolateral and posteromedial, can be identified by exposing the lingular bronchus at its bifurcation and by occluding it, a delineating atelectasis will be produced. Churchill and Belsey² first applied the principle of segmental pneumonectomy and were able to isolate and remove separately, the posteromedial segment of the lingula. When dealing with the right middle lobe, however, it is questionable whether separate extirpation of either of its segments would be advisable. The bifurcation of the middle lobe bronchus is covered with a thick layer of lung tissue and the technical difficulties of exposing the branch bronchi outweigh the advantage of the conservation of a small amount of lung tissue. Except under unusual circumstances, therefore, lesions localized in the right middle lobe should be removed by complete lobectomy.

The upper lobes are made up of four segments: The anterosuperior, the posterosuperior, the anterolateral and the antero-inferior. Positive identification of the antero-inferior segments is often possible. It is usually difficult, however, under ordinary circumstances, to be certain of the boundaries of the other three segments.

Adams and Davenport³ have introduced the following nomenclature in their excellent paper concerning the structural anatomy of the lungs:

<i>Lobe</i>	<i>Division</i>	<i>Segment</i>
Left upper	Apical	Anterosuperior Posterosuperior Lateral Antero-inferior
	Lingular (left middle lobe)	Anterolateral Posteromedial
Left lower	Dorsal	
	Basal	Anteromedial Posteromedial Anterolateral Posterolateral
Right upper		Anterosuperior Posterosuperior Lateral Antero-inferior
Right middle		Anteromedial Posterolateral

Lobe	Division	Segment
Right lower	Dorsal	
	Basal	Anteromedial
		Posteromedial
		Anterolateral
		Posterolateral

*The Clinical Importance of the Major and Minor
Divisions of the Lungs*

Major Divisions: The dorsal divisions of the lower lobes have special significance both surgically and pathologically because these segments are the most frequent sites of pulmonary abscesses. Pulmonary cysts are also frequently localized in this part of the lower lobes (Fig. I, A and B). Bronchiectasis is rarely found, how-

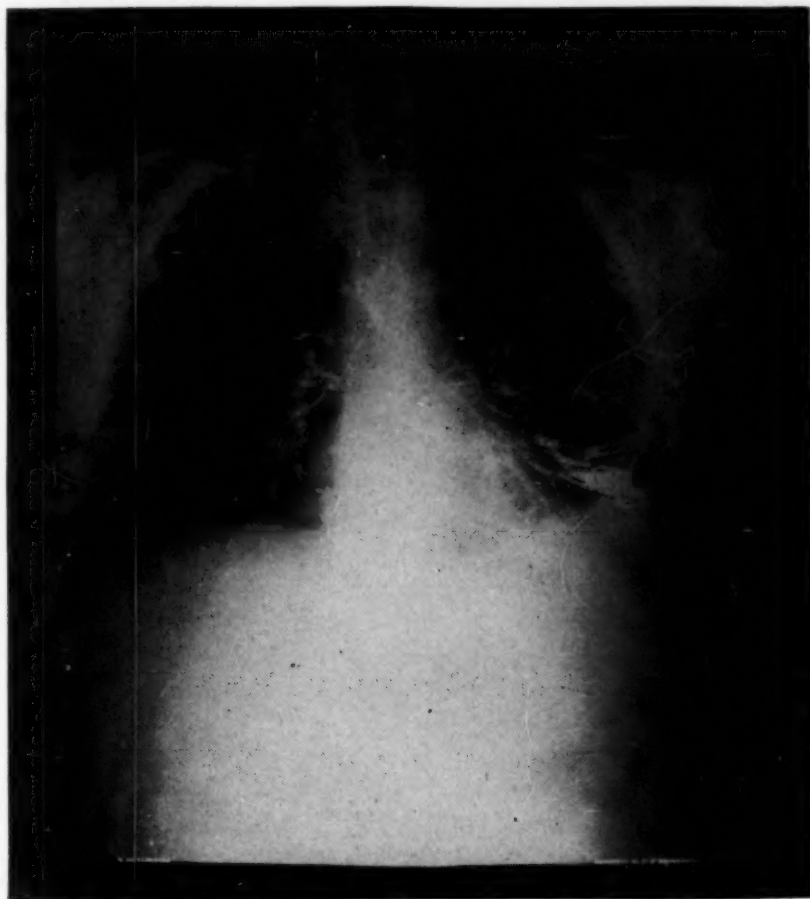


Figure I (A): Roentgenogram showing cyst of lung in the dorsal division of the left lower lobe.

ever, in the dorsal divisions, but is common in the basal divisions. In this connection, it is important to emphasize the frequent bilobar distribution of bronchiectasis, namely, the basal division of the lower lobe and the middle lobe on the same side.

One of the most attractive possibilities for the conservation of lung tissue by partial lobectomy is the extirpation of the middle lobe and the basal division of the lower lobe in cases of bronchiectasis with bilobar distribution of the disease.

Tuberculosis is the predominant disease of the upper lobes and until recently lobectomy for this disease has been avoided. Interest in lobectomy for tuberculous lesions has been revived recently by Churchill⁴ and Maier and Klopstock.⁵ It would appear, however, that if a lobectomy is performed for tuberculosis, the entire lobe should be removed. Partial lobectomy should be reserved for non-tuberculous, inflammatory diseases. Local excision of the anterosuperior or posterosuperior segments of the upper lobes for tuberculosis will probably never be feasible even if the segments could be identified.

Minor Divisions: Bronchiectasis and cystic disease of the lungs

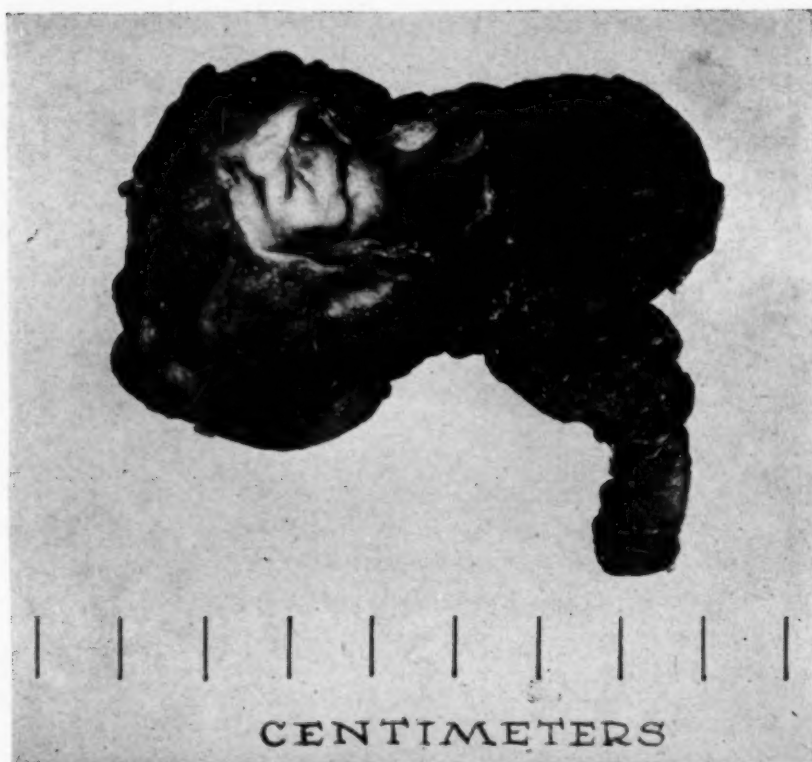


Figure 1 (B): Photograph of cyst after excision of the dorsal division of the left lower lobe.

are often sharply localized in the various segments of the basal divisions of the lower lobes. The same lesions may be encountered in the middle lobes. There are occasional instances when partial upper lobe lobectomy will obviate the necessity for total pneumonectomy in cases of bronchiectasis. This situation may be found in patients with bronchiectasis of the lower and middle lobes with involvement of the anteroinferior segment of the upper lobes on the diseased side. Another important indication for partial lobectomy of the upper lobes will sometimes be encountered in suspected bronchiogenic tumor cases. If a sharply localized peripheral mass is present in a lobe and tissue has not been obtained through the bronchoscope for microscopic study to establish a positive diagnosis, excision of the local lesion should be performed before a radical operation is undertaken. Gross examination and microscopic study of the tissue will establish or eliminate the necessity of a total pneumonectomy.

Identification of the Surgical Divisions of the Lungs: Unless inflammatory changes have obliterated the normal anatomical landmarks, the bronchi to the eight major divisions of the lungs can be exposed and precise localization of the division accomplished by occluding the bronchus and producing a delineating atelectasis (Fig. II). In most cases of bronchiectasis or cystic disease, careful dissection will be rewarded by adequate exposure of the bronchi and vessels in the hilum of the lobe which requires extirpation. The severe reaction associated with pulmonary abscesses, however, often precludes a successful dissection and it is usually necessary to perform a complete lobectomy in these cases. The problem when dealing with any of these divisions is straightforward. The bronchus to the division is isolated and its boundaries are easily defined. If this is not possible, the entire lobe should be removed.

The importance of precise preoperative localization of pulmonary disease with an accurate appraisal of its boundaries in terms of bronchopulmonary segments cannot be overemphasized. This can be accomplished by conventional roentgenograms, visualization of the tracheobronchial tree with radio-opaque oil and examinations with the bronchoscope. If partial lobectomy is contemplated, preoperative localization becomes even more important. This information combined with actual inspection and palpation of the lungs when the operation is undertaken, will aid in localizing the minor divisions of the lungs, when the disease is confined to one or more segments. Careful examination of the lung surface not infrequently will reveal rudimentary fissures which suggest approximate boundaries of the segments. These surface markings become more apparent when rapid variations in intrapulmonic pressures are

accomplished through the intratracheal catheter. Moreover, it is our impression that often diseased segments fail to inflate as rapidly as adjoining normal segments. When a palpable mass is encountered it is of considerable significance, but failure to palpate a mass does not mean that a pulmonary lesion is not present.

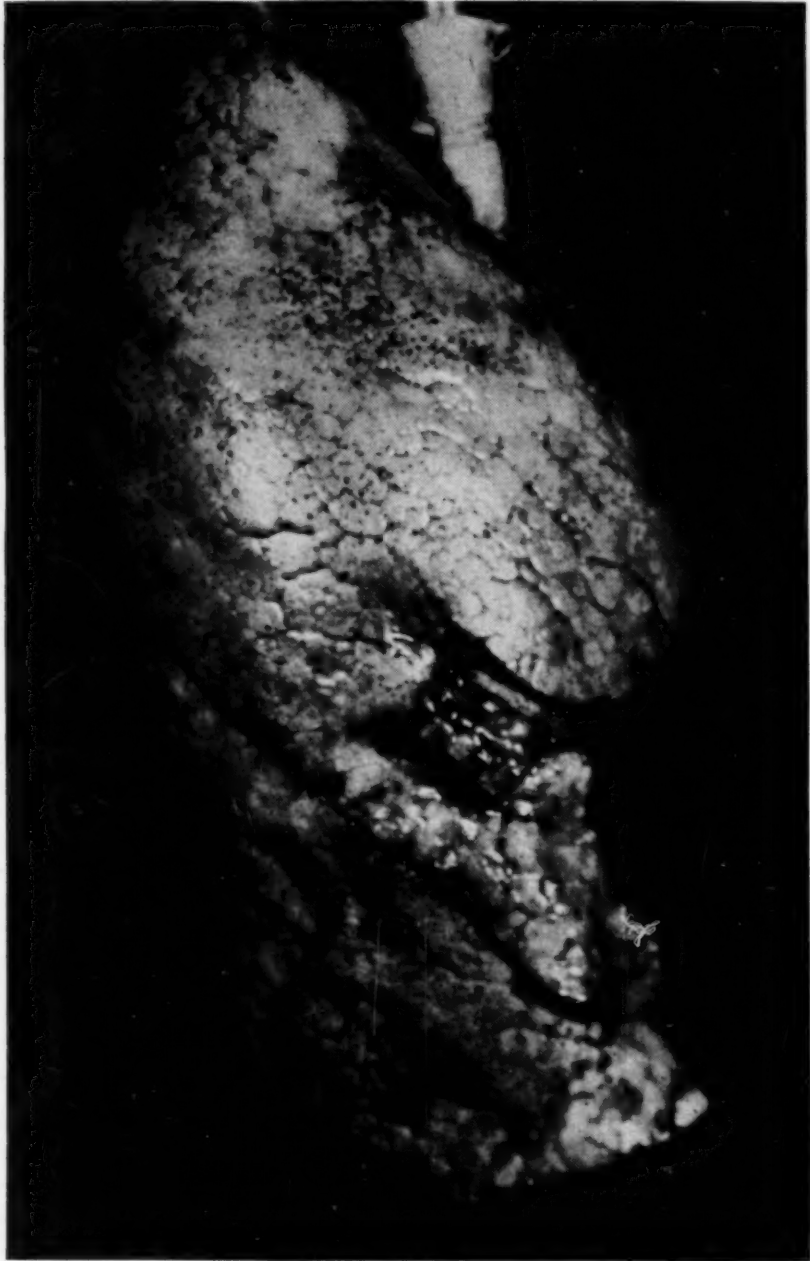


Figure 11: Delineation of the lingula of the left upper lobe (Left middle lobe) by atelectasis produced by occluding the bronchus to the lobe.

Partial excision of a lobe, particularly through the basal division of the lower lobes, entails the division of thick, vascular lung tissue. This can be accomplished by dividing the lung tissue between clamps and the rich blood supply of the lung apparently prevents permanent damage to adjacent normal pulmonary parenchyma. When the incision is carried through diseased pulmonary tissue, there can be no mistake concerning the failure to identify the position of the lesion. If this does occur, the surgeon must abandon partial lobectomy and remove the entire lobe or alter the line of incision to pass through healthy pulmonary tissue.

SUMMARY

Comment: If partial lobectomy is confined to the extirpation of the major surgical divisions of the lungs, there is little danger of

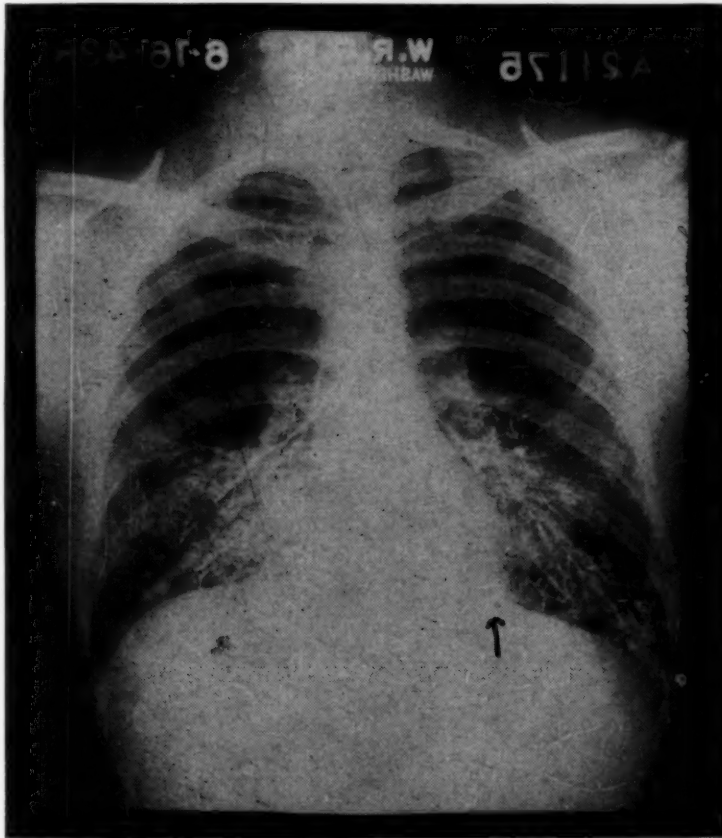


Figure III (A): Bronchogram showing bronchial dilatations sharply localized to the anteromedial segment of the basal division of the lower lobe. Visualization of the remainder of the bronchi failed to reveal bronchiectasis elsewhere in the lungs. The patient coughed up blood and pus from the sharply localized bronchial dilatations. Excision by partial lobectomy gave prompt relief of symptoms.

failure to identify the segment. It would be easy, however, to perform an incomplete operation when removing one or more of the minor divisions. It appears, therefore, that if there is any question concerning the amount of lung tissue to be excised, the surgeon is obligated to error on the radical side. Inadequate extirpation of diseased tissue will cast disrepute on the principal of partial lobectomy, which is sound when employed properly. The excision of one or more of the minor pulmonary segments will have limited application and must be reserved for cases in which the lesion is peripheral and sharply localized. Preoperative localization of the disease must coincide exactly with the findings when the lung is exposed at operation.

It should be recorded categorically, that neoplasms of the lungs should not be treated by partial resection of lung tissue. The practice of local excision of a mass of undetermined origin will be useful in establishing a positive diagnosis and will undoubtedly lead to an increasing number of successful operations for peripheral

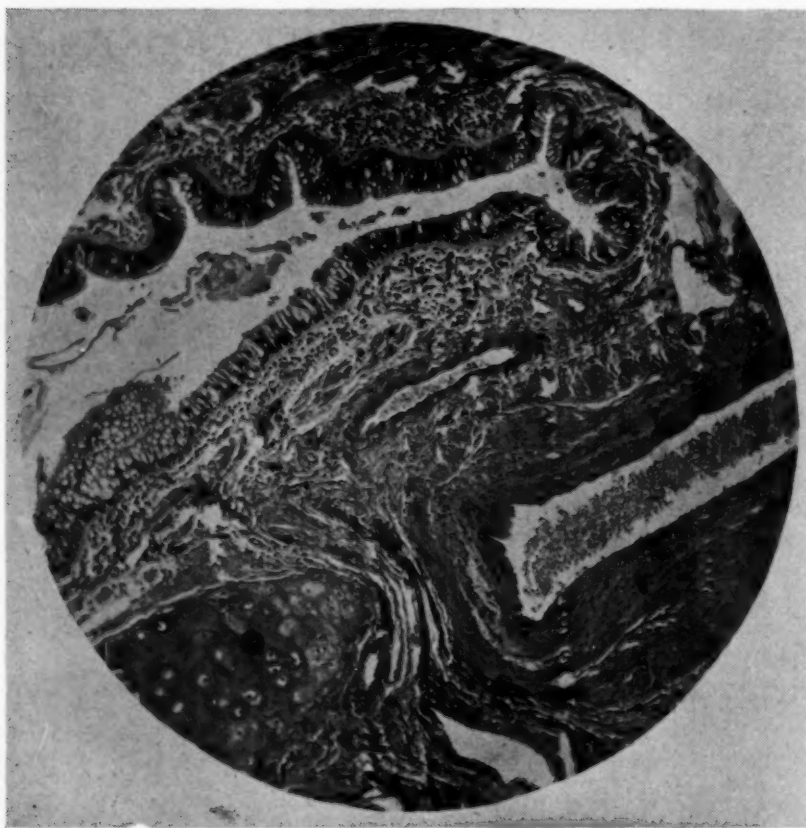


Figure III (B): Photomicrograph of section through the excised segment.

lung tumors. If, however, a neoplasm of the lung is found when partial lobectomy is performed, for diagnostic purposes, a radical operation should be undertaken regardless of the apparent clean removal of the localized mass. An example of a suitable case for partial lobectomy with removal of a minor division of the lung is illustrated in Fig. III, A and B.

The relative operative risks of partial and complete lobectomy are probably about the same. My own experience has been limited to the performance of 17 partial lobectomies. In this group there was one death. During the same period 55 complete lobectomies were performed and in approximately half of these, it was necessary to remove two lobes. There was one death in the latter group. These figures, however, are of no statistical value. Assessment of the influence on the immediate mortality of partial as compared to complete lobectomy must await further experience. The only significance of the principle is that important amounts of lung tissue may be conserved in selected cases.

RESUMEN

Si se limita la lobulectomía a la extirpación de las divisiones quirúrgicas principales de los pulmones, no hay casi miedo de no poder identificar el segmento. Empero, sería fácil llevar a cabo una operación incompleta cuando se intenta la excisión de una o más de las divisiones menores. Es aparente, pues, que si existe duda alguna respecto a la cantidad de tejido pulmonar que se debe extirpar, el cirujano está obligado a errar por el lado radical. La extirpación inadecuada de tejido morbosos acarreará el descrédito del principio de la lobulectomía parcial, que es un principio sólido cuando se le emplea correctamente. La excisión de uno o más de los segmentos pulmonares menores es aplicable en forma limitada y debe reservarse para casos en los que la lesión es periférica y está bien localizada. La localización preoperatoria de la lesión debe coincidir exactamente con los hallazgos al descubrir el pulmón durante la operación.

Se debe expresar categóricamente la opinión de que las neoplasias pulmonares no deben tratarse por medio de la resección parcial de tejido pulmonar. El método de excisión local de masas de origen indeterminado será útil en establecer diagnósticos positivos e indudablemente resultará en un número creciente de operaciones con buen éxito en tumores pulmonares periféricos. Empero, si se descubre una neoplasia pulmonar cuando se ha llevado a cabo una lobulectomía parcial por razones de diagnóstico, debe ejecutarse entonces una operación radical, aunque parezca que la masa localizada ha sido extirpada por completo. En los Grabados III,

A y B, está ilustrado un caso apropiado para la lobulectomía parcial con la excisión de una división menor del pulmón.

Los relativos riesgos operatorios de la lobulectomía parcial y de la completa son probablemente más o menos idénticos. Mi propia experiencia se limita a la ejecución de 14 lobulectomías parciales. Hubo una muerte en este grupo. Durante el mismo período fueron ejecutadas 26 lobulectomías completas y aproximadamente en la mitad fue necesario éxtirpar dos lóbulos. No hubo muertes en este otro grupo. Sin embargo, estos datos no tienen valor estadístico. Es necesario obtener más experiencia antes de poder avaluar la influencia que tiene la lobulectomía parcial, comparada con la completa, sobre la mortalidad inmediata. El significado único de este principio es que puede preservarse cantidades importantes del tejido pulmonar en casos seleccionados.

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Diasone in Treatment of Pulmonary Tuberculosis*

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A few years ago it was found that the sulfone compounds have a very favorable effect in the treatment of experimental tuberculosis in guinea pigs.^{1,2,3,4,5} Promin was the first of these drugs to be used clinically for pulmonary tuberculosis in humans.^{5,6}

In January 1943 Petter of Waukegan, Illinois, began the clinical investigation of Diasone—the disodium formaldehyde sulfoxylate derivative of diaminodiphenylsulfone.⁸ He reported encouraging results,⁹ and in March 1943 we began to use Diasone at Mineral Springs Sanatorium. To date we have given the drug to a total of 74 patients, 25 of whom were unable to continue treatment due to undesirable toxic reactions.

This report is concerned chiefly with a series of 36 patients who have received an average daily dose of .9 grams or more for a period of 120 days or longer. Some of the patients required short rest periods intermittently due to a drop in hemoglobin or other toxic symptoms. However, the average daily dose was computed on the basis of total elapsed time, including the rest periods. Dosage was regulated to approach the individual's limit of tolerance. Patients receiving collapse therapy which affected the lesions under study are not included in this group.

All of these patients were under sanatorium care and management. Thirteen of them had been in the sanatorium for periods varying from several months to several years before receiving the drug. To the other 23 it was given within two or three weeks after admission. The amount of exercise permitted them was based on the clinical requirements of the individual and was not altered because of the chemotherapy. In this way we felt that better conclusions could be drawn as to the effectiveness of the drug.

Since Mineral Springs Sanatorium averages about 100 patients, it is obvious that no attempt could be made toward developing a similar series of patients as controls. We have attempted in this investigation to include a representative cross section of the pa-

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The Diasone used in this investigation was supplied through the courtesy of the Abbott Laboratories, North Chicago, Illinois.

tients who were not receiving adequate collapse therapy. The types of disease process present include exudative, fibroid, and caseous lesions.

Before treatment with the drug was begun an x-ray was taken of the chest, sputum analyses, urinalyses, and hematological studies were made. At weekly intervals, or oftener if it seemed indicated, hemoglobin determinations were made and white cell counts done.⁶ Once a month the blood concentration of Diasone was determined. Urinalyses were done at monthly intervals or oftener, as deemed necessary. Chest x-rays were taken at intervals of four to eight weeks with a few exceptions. Sputum examinations were done monthly while positive. When sputum smears became consistently negative, gastric lavage was done for microscopic and culture studies.

Dosage: The total number of days treatment in this group ranged from 120 to 399 days. The average dose varied from .9 gram to 4.56 grams. Two patients received a daily average of less than one gram; 28 patients received from one to three grams daily; and three patients received more than three grams daily. The average daily dose of all of these patients was 1.70 grams. The average number of days per patient receiving Diasone was 200 days.

In a paper of this length it is not possible to discuss the toxic effects of Diasone in detail. Like other sulfone compounds^{6,7} it has definite toxic manifestations, the type and degree of which show great individual variation. In this series of 36 patients, all but six exhibited toxic symptoms of some degree. In 22 cases the toxicity was mild; in eight it was moderate but not severe enough to necessitate abandonment of chemotherapy. Toxic symptoms consist chiefly of gastro-intestinal and nervous symptoms, viz. anorexia, nausea, flatulence, nervousness, insomnia, headache, and malaise.

In addition to causing subjective symptoms, Diasone apparently is more or less toxic to the hematopoietic system. An appreciable reduction in hemoglobin reading occurred in 18 of the 36 patients, the reduction ranging from 6 to 24 per cent. The leukocytes did not appear to be significantly affected. In this series there were no cases of leukopenia and the blood smears showed no evidence of immaturity in the white cells.

In all but three of our 36 patients there was some degree of cyanosis. In 23 cases it was mild; in eight it was moderate; and in two cases it might be called severe.

The highest blood concentration for Diasone ranged from less than 0.1 mg. per cent to 3.79 mg. per cent. There seemed to be no constant correlation between the blood concentration of the drug and the degree of cyanosis or the severity of toxic symptoms.

Furthermore, the blood concentration has not been found to bear any exact relationship to the dosage of the drug.

In 19 cases supplements of liver extract, ferrous sulphate, and Brewer's yeast have ameliorated both the subjective symptoms and the anemia which tends to occur. Five of the 36 patients were given liver extract and iron, five were given Brewer's yeast, and nine were given all three supplements in addition to Diasone.

We would also like to mention other toxic reactions which have occurred among the entire series of 74 patients who have received Diasone for varying lengths of time. There have been four cases of dermatitis, accompanied by fever, malaise, and other systemic effects. In the most severe case,¹⁰ symptoms included fever as high as 104°, angina, nausea, and vomiting, and a generalized maculopapular eruption which became vesicular and finally extensively exfoliative. In an additional group of six patients, Diasone had to be discontinued because of the marked secondary anemia which it produced. In one patient who received an average of 1.2 grams daily for 34 days, the hemoglobin dropped from 50 to 46 per cent although the patient was receiving supplement of iron and liver extract. Administration of Diasone was then stopped, but in the following two weeks the hemoglobin continued to drop 28 per cent, and the blood smear showed every type of immature erythrocyte, including megaloblasts. The blood picture in this case has since returned to the previous level. In only one case in the entire series has there been evidence of kidney damage. This patient developed a lumbar backache and gross hematuria which slowly disappeared after the drug was discontinued. In one case chemotherapy had to be abandoned because of the marked mental depression and irritability produced in the patient. In a total of fifteen cases Diasone was discontinued because of other intolerable subjective symptoms, especially anorexia, nausea, nervousness, and insomnia. However, in most of these cases the drug merely aggravated pre-existing symptoms.

Before treatment was started four of the cases were classified as minimal, fifteen as moderately advanced, and seventeen as far advanced. Twenty-four patients had definite patent cavitation. Twenty-eight had positive sputum to smear examination. One patient had positive gastric cultures.

Results: In attempting to analyze our roentgenological results we decided to divide the group into five categories: 1. Marked or unexpectedly rapid improvement. 2. Moderate improvement. 3. Slight improvement. 4. No change. 5. Worse. We, of course, realize how difficult it is to determine arbitrarily the degree of x-ray improvement. In this respect we had only our past experience in treating similar cases without chemotherapy to guide us.

X-RAY RESULTS

Results	Classification before treatment			Total
	Minimal	Mod. Advanced	Far Advanced	
Marked Improvement		1	1	2
Moderate Improvement	1	5	4	10
Slight Improvement	3	4		7
No Change		3	6	9
Worse		1	7	8

With one exception the lesions which showed the most improvement were chiefly exudative in character. However, three minimal cases with exudative lesions showed only slight improvement. Five of the cases which became worse showed fresh exudative infiltration and in two cases new cavities appeared.

Of the 28 patients who had positive sputum before chemotherapy was started, nine became negative to repeated concentrated smear examination. Six of these nine patients changed from a positive sputum to negative gastric microscopically. Cultures in these cases have not yet been completed. One patient changed from positive gastric culture to negative gastric culture. One patient changed from negative gastric culture to positive gastric culture. In six patients sputum smears and gastric cultures have always been negative.

RESULTS AS SHOWN BY SPUTUM AND GASTRIC CULTURES

	No. of Cases
1. Sputum conversion (microscopic)	3
2. Conversion from positive sputum to negative gastric (smear)	6
3. Positive gastric culture to negative gastric culture	1
4. Sputum remains positive	19
5. Negative gastric culture to positive gastric culture	1
6. Sputum and Gastric culture always negative	6

An appreciable drop in sedimentation rate occurred in 20 patients—of these 17 dropped to within normal limits. In three cases the sedimentation rate increased five points or more.

Comment: It is our opinion that Diasone falls considerably short of our hopes for a chemotherapeutic adjunct for the treatment

of tuberculosis in humans. However, in view of our small series of cases, and lack of controls, we cannot definitely conclude that Diasone is without benefit, particularly in fresh exudative lesions. While we must admit to some disappointment, we believe further investigation of Diasone is indicated. The drug is now under clinical investigation in many other sanatoria in the country. In due time Diasone's value, or lack of value, in the treatment of tuberculosis will be definitely determined.

COMENTARIO

Opinamos que la Dasona es muy deficiente como un adjunto quimioterapéutico para el tratamiento de la tuberculosis en los seres humanos. Empero, en vista de nuestra pequeña serie de casos y la falta de testigos, no podemos concluir definitivamente que la Dasona no tiene valor alguno, particularmente en lesiones exudativas recientes. Aunque tenemos que admitir algo de desengaño, opinamos que se debe continuar la investigación de la Dasona. Ahora se está investigando la droga clínicamente en muchos otros sanatorios del país. A su debido tiempo se determinará definitivamente el valor o carencia de valor de la Dasona en el tratamiento de la tuberculosis.

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Discussion

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It is a distinct pleasure to open the discussion of this paper, since Dr. Pfuetze and I have worked along simultaneously with investigations of the possible therapeutic value of Diasone. Knowing how critically each bit of his data was scrutinized in the study just reported and how very competent is the management of Dr. Pfuetze's patients, I am not surprised at his expression of some degree of disappointment. When one has access to only small groups of patients, rather than large numbers, one is often confronted with some who do not respond as wished, and then will encounter a group which will react well.

The general plan of Dr. Pfuetze's attack has been similar to ours except for two distinct differences. He has not modified the physical activity of his patients as we endeavored to do. We felt that removing the effects of bed rest, if possible, would give us a clearer picture of what might be expected with Diasone administration. Secondly, we did not employ any supplementary medication, as it was our desire to determine just how the body would react to Diasone alone.

It is obvious from Dr. Pfuetze's report today and from unpublished communications from other observers, that liver and iron and brewer's yeast are of decided value as adjuncts. These supplementary substances permit the larger doses of Diasone to be maintained and reduce the untoward reactions.

Hematuria and other evidences of renal damage have not been observed in patients treated by us. However, from the U. S. Public Health Service Leper Hospital, in Louisiana, we have received a report of six cases of hematuria in a group of patients treated with Diasone.

It is very interesting to hear from some one else a statement that the Diasone blood level does not correspond proportionately to dosage, severity of reactions or apparent clinical effect. This has been one of our observations, unexplainable in the light of our present knowledge concerning the metabolism and excretion of the compound. Much work has been done in our laboratory on this problem and reams of data sheets accumulated. We have endeavored to show some relation between dosage, body weight, and blood level; between dosage, blood and urinary concentrations at various hours; and, while doing this, we also made observations on the concentration of Diasone in the spinal fluid, saliva, bronchial secretion, pleural and peritoneal fluids and feces.

Dr. Pfuetze expresses the feelings of all of us who have investigated clinically the application of Diasone in human tuberculosis. The compound does not control tuberculous disease in the human in any way comparable to its effects in experimental animals. We can not, because of this, conclude that it is without any benefit, nor must we permit the entertainment of an idea that it will cure all cases of, for example, early exudative tuberculosis.

Those who have had occasion to observe the reports from several sources of investigation must feel that a beach head has been established. Results have been as hoped for in some instances and adverse in others. As more material is made available, leading to a greater number of treated patients, and, perhaps, as different modes of administration are adopted, we shall more nearly approach our objective.

Discussion

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At the Edward Sanatorium, Naperville, Illinois, we have treated thirty-nine patients with Diasone since January, 1944. Twenty-two of these cases had Diasone for more than ninety days and the majority of them, for more than 120 days. The short time permitted for discussion does not allow me to analyze this number in a more detailed manner. However, I wish to state that out of these thirty-nine patients, five developed a spread while taking Diasone; and only four showed moderate improvement, which did not exceed anything seen in our control group or among those patients on bed rest.

The limited time of our experiment does not permit definite conclusions. Only one exceptional case of bilateral, upper lobe, recent, hematogenous tuberculosis with a positive sputum showed unusually rapid clearing within two months, which was out of pace with the usual speed of clearing. This suggests tentatively that we are dealing with a drug which is effective in cases of the hematogenous type and perhaps is bactericidal rather than nosotropic, which means working via the reticuloendothelial system. It would be interesting to treat acute miliary tuberculosis with large doses of Diasone in order to prove whether there is any basis for such an assumption.

Present Status of Chemotherapy in Tuberculosis from the Clinical Standpoint*

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During the past few years there has been an increasing interest on the part of physicians throughout the country in the chemotherapeutic approach to tuberculosis. With the advent of the various sulfa drugs and their striking therapeutic effect on certain bacterial infections, research workers were spurred to study the effect of these drugs on tuberculosis. These studies on the sulfa drugs with respect to tuberculosis were disappointing, but led to the introduction of a new series of drugs—the sulfones.

Feldman, Hinshaw, and Moses found by experimentation on guinea pigs that certain of these drugs had the very definite and striking ability to actually arrest the progress of otherwise uniformly fatal tuberculosis, even when treatment was delayed for six weeks after inoculation.¹ Such striking results had never before been attained in all the years of research in the field of tuberculosis throughout the world. It represented a tremendous forward step.

The first of these sulfone compounds recognized to be of therapeutic value in animals was Promin¹ (sodium p, p'—diaminodiphenylsulfone n, n' di dextrose sulfonate) developed by research chemists in the laboratories of Parke, Davis & Company. After further thorough animal experimentation, a clinical trial of the drug on human beings seemed definitely indicated. With the close collaboration of Doctors Hinshaw and Feldman of the Mayo Clinic, a group of patients at nearby Mineral Springs Sanatorium was started on the drug in March 1941. A progress report of our first year's results was given before the annual meeting of the National Tuberculosis Association in Philadelphia in May 1942.² A subsequent report on the progress of this same group appeared in the July 1944 issue of the *American Review of Tuberculosis*.

It is not my purpose to go into detail regarding the results of our clinical investigation of Promin at this time as these have been considered at length in the above-mentioned communications. Suffice it to say, it is our belief that the drug had a favorable effect on the course of the disease in those patients who exhibited pre-

*Read before the Rocky Mountain Chapter, American College of Chest Physicians, Denver, Colorado, September 27, 1944.

**Mineral Springs Sanatorium.

dominantly fresh, exudative lesions. No overnight cures were noted to be sure, but 22.2 per cent of the patients in the group revealed more rapid improvement as shown by Roentgen examination than was to be expected from a routine rest regimen alone.

Reports in the literature from investigators in England³ working independently confirmed our impression by drawing similar conclusions. Investigations at Muirdale Sanatorium, Milwaukee, and the Wisconsin State Sanatorium likewise indicated encouraging results from Promin.⁴ Hyman, Zucker, and Pinner,⁵ using the drug intravenously in large doses for a short period of time concluded that no favorable effects on the disease were obtained with this method. Investigators at Glen Lake Sanatorium, Minneapolis,⁶ and Maybury Sanatorium, Detroit,⁶ on the basis of a small experience concluded that the toxic effects of the drug outweighed any possible benefits.

We have, in addition, a group of seven cases of bone tuberculosis with draining sinuses, which have been treated with Promin orally and with Promin jelly locally. In four of these the drainage stopped within two months after administration of Promin therapy. In the other three cases improvement was definitely more rapid than would normally be expected. This is, of course, a very small series and is not intended as being conclusive of any definite therapeutic achievement. We are encouraged, however, to enlarge the series with similar cases and to continue our studies in this direction.

Perhaps the chief factor preventing a more widespread use of Promin is its toxic properties. Nearly two-thirds of our patients were unable to take the drug in minimal doses for any length of time. Its use tends to cause a drop in hemoglobin in the majority of patients, and in a few cases leukopenia was noted as well.⁷ In addition anorexia and restlessness were a rather common accompanying complaint.

In 1942 the Abbott Laboratories developed Diasone (disodium formaldehyde sulfoxylate diaminodiphenylsulfone). Investigations with this drug in guinea pigs were sufficiently encouraging to justify its clinical trial on human beings. In January 1943, Petter and Prenzlau began its use on patients at Lake County Sanatorium, Waukegan, Illinois.⁸ They reported favorable results and in March 1943, we at Mineral Springs Sanatorium began its use.

Before the American College of Chest Physicians meeting in Chicago,⁹ June 1944, we reported our results of fourteen months clinical investigation of Diasone in the treatment of pulmonary tuberculosis. Our report was concerned chiefly with a series of 36 patients, who had received an average daily dose of .9 grams or more for a period of 120 days or longer. The total number of days treatment ranged from 120 to 399 days. The average daily dose of

all the patients was 1.70 grams. The group included a representative cross section of patients who were not receiving adequate collapse therapy. Before treatment was initiated four cases had been classified as minimal, fifteen as moderately advanced, and seventeen as far advanced. The types of disease process included exudative, fibroid and caseous lesions. Aside from the chemotherapy the patients received routine sanatorium bed rest and general care.

Time does not permit me to go into the results of this study in detail here. We concluded, however, that Diasone fell considerably short of our original hopes for a chemotherapeutic adjunct in the treatment of tuberculosis in man. Only two patients in the entire series showed what might be considered as marked or unexpected improvement as measured by serial Roentgen examination. Eight of the patients showed definite spread of their disease process while taking the drug. Ten showed moderate improvement, seven slight improvement, and in nine no change could be demonstrated by repeated x-ray studies. It will be interesting to compare these findings with those of a number of investigators throughout the country who are at present engaged in similar studies with the drug.

We found that Diasone was somewhat less toxic than Promin, in similar doses, to the hematopoietic system, but it too, is accompanied by undesirable side-reactions. A reduction of the hemoglobin occurred in 18 of the 36 patients, ranging in degree from 6 to 24 per cent. Nervousness, irritability, and anorexia were not uncommon. One severe reaction, which we had occasion to report elsewhere,¹⁰ included fever to 104°, angina, nausea, vomiting, and a generalized maculopapular eruption which became vesicular and finally extensively exfoliative.

Some investigators have taken occasion to stress the extreme cyanosis present in guinea pigs resulting from the use of this drug. Concern has been shown regarding the possible deleterious effects of this phenomenon occurring in patients receiving Diasone. We observed cyanosis in all but three of our 36 patients. In 23 cases it was mild; in eight it was moderate; and in two cases it might be called severe. However, the degree of cyanosis seemed to bear no correlation to the other undesirable side-reactions which occurred nor have we observed any harmful effects from cyanosis alone.

A third sulfone drug which also has shown considerable promise in animal experimentation is Promizole¹¹ (4, 2'-Diaminodiphenyl-5-thiazolesulfone) a product of Parke, Davis & Company. Our clinical investigation of this drug has not been completed but certain facts have become apparent to date.¹²

It is much less toxic in man than either Promin or Diasone and thus can be given in much larger dosage. A tolerated daily dose of 10 to 12 grams or more for several months is not uncommon in our experience. Clinical studies now in progress would indicate that Promizole falls distinctly short of the ideal remedy. In renal tuberculosis it appears to give some symptomatic relief but in no cases to date have we noted a disappearance of tubercle bacilli from the urine. Five patients with tuberculous meningitis and two patients with miliary tuberculosis have received Promizole without benefit. We regret that it is too early to report anything definite regarding its effect in pulmonary tuberculosis.

With so many workers searching for an effective chemotherapeutic agent against tuberculosis it would seem advisable that certain standards of clinical investigation be followed by the various investigators as each new product appears.¹³

First, before any drug is used in man it must be thoroughly investigated in animals; this study to include both its therapeutic effectiveness and toxic reactions. It should be stressed that this is the method by which all of the great advances in chemotherapy have been achieved. When a better or easier method has been evolved then the method of guinea pig trial may be abandoned.

Second, it must then be tried cautiously on patients whose consent for such trial has been obtained after fully acquainting them as to the purpose and possible dangers of such a study. This must be done in an institution where adequate facilities for observation and laboratory control are available.

Third, we believe that much time and effort can be saved by careful selection of the cases to receive chemotherapy. The fresh exudative lesion obviously stands to gain the most by any successful chemotherapeutic agent because of the histo-pathologic process present. In such cases there is a minimum of tissue destruction, and the blood supply to the diseased area, which carries the chemotherapeutic agent, is less impaired. The sulfa drugs for example, are very effective in an early case of pneumonia, but are of little value in a case of long standing lung abscess. For the same reason we can scarcely expect any startling, immediate results in the closure of an old chronic tuberculous cavity with chemotherapy.

We suggest, therefore, that in our preliminary investigations our attack be limited to those cases which demonstrate either an initial exudative spread or a similar progression secondary to an old established lesion. In this regard we fully appreciate that it is just such fresh lesions which tend to improve under a routine rest regimen alone. Nevertheless, if a drug has a really favorable effect on the course of the disease, a careful study of a large series

of such cases should reveal a rapidity and uniformity of improvement not otherwise expected. It goes without saying that these cases must be drawn from a group in which no effective collapse measures have been employed. We recognize the desirability of having a group of similar patients, not receiving chemotherapy, to serve as a control group. In the larger sanatoria such a plan would usually be feasible and should be carried out whenever possible. In a large institution a carefully planned program intensively carried out for six to eight months should reveal whether or not a drug is therapeutically effective. We do not believe that a drug should be used in those cases where some conventional and accepted therapeutic procedure is indicated, such as pneumothorax or thoracoplasty for example.

Fourth—Dosage: In our experience considerable time was spent in determining what we felt might be a minimal therapeutic dose, and at the same time avoiding what might be a toxic dose. A drug cannot be discarded as being ineffective until ample trial of its maximal tolerated dose proves it such. The method of administration should be similar to that which has achieved results in experimental animals. We have found that tolerated doses vary considerably with different patients.

Fifth. In order to investigate the effectiveness of each new promising drug it would be advisable for several sanatoria in different parts of the country to carry on studies simultaneously using in general the same technique of administration. In this way each drug could be evaluated in the shortest possible time for at best, months of study on many patients are necessary for such evaluation.

It is also possible that some anti-biotic similar in nature to Penicillin may be discovered which will prove effective against tuberculosis.

SUMMARY

To summarize briefly then, it is our opinion that Promin though probably of value in some cases, is too toxic for widespread general use. Diasone, though less toxic than Promin, clinically falls far short of our original expectations. Promizole, which is much less toxic than either of the other two, is still under clinical investigation thus precluding any accurate evaluation at this time. Other compounds are at present undergoing animal and laboratory experimentation. Those showing promise will require clinical investigations. We cannot and must not shirk this responsibility. With the whole problem of chemotherapy in tuberculosis thus in a state of flux it is imperative that we remain open-minded to every new advance, critical of unproved assertion but fully alert to incor-

porate and develop promising compounds. We believe that at last we have our foot in the door, so to speak, and we have every right to assume that in time a drug or some other agent will be found which will closely approach our exacting goal. The recently organized tuberculosis unit of the United States Public Health Service is vitally interested in this problem and has promised its close cooperation and active help in working toward its solution. It may be next year, or five, or ten years hence before success will crown the endeavors of the many men engaged in this field but certain it is that the goal is worth many times the effort.

RESUMEN

Somos de opinión que la Promina, aunque probablemente valiosa en algunos casos, es demasiado tóxica para el uso general. La Diasona, aunque menos tóxica que la Promina, es muy deficiente desde el punto de vista clínico y ha defraudado nuestras expectativas originales. El Promizol, que es mucho menos tóxico que las otras dos drogas, todavía está sometido a investigación clínica, lo que excluye al presente su exacto avalúo. Otros compuestos están ahora pasando por experimentos de laboratorio y en animales, y los que den esperanzas necesitarán investigación clínica. Ni podemos ni debemos eludir esta responsabilidad. Con el problema entero de la quimioterapia en la tuberculosis en un estado variable es imperativo que permanezcamos imparciales ante cada nuevo adelanto, críticos de aseveraciones no demostradas, pero listos a incorporar y perfeccionar compuestos prometedores. Nos parece que al fin tenemos la puerta entreabierta, si se nos permite esta expresión, y tenemos derecho de suponer que con el tiempo se descubrirá una droga, u otro agente, que se aproxime a nuestro exigente objeto. La División de Tuberculosis del Departamento de Salubridad Pública de los Estados Unidos, recientemente establecida, tiene un interés vital en este problema y ha prometido su íntima cooperación y activa ayuda en laborar hacia su solución. Quizás sea el año entrante, o en cinco o diez años, cuando el buen éxito recompense los esfuerzos de los muchos hombres ocupados con esta problema; pero es indudable que el objeto que se persigue vale la pena de ser logrado.

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Tuberculosis of the Nasopharynx Its Frequent Incidence and Clinical Significance*

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Human tuberculosis has aroused the interest of physicians for many centuries before the epochal discovery by Robert Koch of the causative bacillus. Since that discovery the amount of research that has been carried on and the literature that has accumulated are almost beyond belief. Yet there are many unsolved problems pertaining to the pathology and pathogenesis of this malady.

This is especially true of tuberculosis of the nasopharynx, for which reason it is believed that the following brief report of investigation in that field may prove of interest to the general medical profession as well as to rhinolaryngologists.

It should not be overlooked that tuberculosis of the nasopharynx is far from being rare. As a matter of fact it occurs in the course of pulmonary tuberculosis, according to our experience, probably more frequently than tuberculosis of the larynx.

The statistics of Wilson,¹ which appear to be in accord with those of most authors, show that laryngeal involvement in pulmonary tuberculosis occurs in less than 5 per cent in minimal pulmonary disease, almost 10 per cent in moderate pulmonary tuberculosis and no more than 20 per cent in far advanced pulmonary infection. Even if we accept the total percentage as being approximately correct, the incidence of nasopharyngeal tuberculosis is greater, for in 24 subjects with varying forms of pulmonary tuberculosis in the series comprising the material for the present investigation, the nasopharynx was involved in 18 specimens (75 per cent). Gross lesions were visible in 14 instances, while in four the lesions were detected only by microscopic examination.

Pathologic Considerations

Our interest in nasopharyngeal tuberculosis was aroused in the course of a routine pathologic study of 140 autopsy specimens of the nasopharynx. The subjects were for the most part adults in mental institutions. And, as previously stated, of 24 cases of pulmonary tuberculosis found in the total number of specimens, 18

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showed definite evidence of tuberculous disease in the nasopharyngeal cavity.

It should be stated at the outset that tuberculosis of the nasopharynx in adults does not as a rule imply tuberculosis of adenoid tissue. In fact, the pathologic process is generally an ulcerative lesion on the posterior part of the roof and of the upper part of the posterior wall. Less frequently tuberculous lesions were found on the posterior margin of the ostia of the eustachian tubes and the nasopharyngeal surface of the uvula and soft palate.

The importance of histopathologic study is shown through the circumstance that in four of our cases only careful microscopic examinations of the material from several blocks revealed tuberculous changes. In this connection the studies of Graff² are of interest, since they gave similar results. In 118 subjects with open, active tuberculosis of the lungs, he noted gross lesions in 36 per cent, while by histopathologic study tuberculous findings were confirmed in a total of 82 per cent.

On the basis of our observations and the literature it seems reasonable to theorize that nasopharyngeal tuberculosis may be *primary*, or *secondary*. The primary type, like primary laryngeal tuberculosis, is exceptionally rare. The secondary type doubtless is the one commonly observed. It is not altogether difficult to realize that tuberculosis of the middle ear may involve the nasopharynx through the eustachian tube. Hematogenous involvement of the nasopharynx from a particular tuberculous focus, while likely, is difficult to confirm. The important etiologic factor in tuberculosis of the nasopharynx is observed in the inoculation of the mucous membrane of the nasopharynx by tubercle bacilli contained in the sputum. Such an inoculation, as a general rule, may serve to explain the localization of ulcers in the posterior part of the roof and the posterior wall of the nasopharynx. Less frequently, however, as has been mentioned, tuberculous lesions are detectable on the posterior margin of the ostia of the eustachian tube and on the nasopharyngeal aspect of the uvula and soft palate.

In our material the superior cervical retropharyngeal lymph nodes were not involved. Only the deep inferior cervical lymph nodes showed tuberculous changes.

The nature of the gross pathologic changes is of paramount importance for the clinical recognition of the disease. Such gross changes are commonly characterized by irregular ulcers, ordinarily ovoid, with undermined margins and yellowish-grey bases.

Histopathologic changes embrace the following: Subepithelial tubercles, composed of epithelioid cells, giant cells, incipient or advanced caseation necrosis. It should be mentioned, however, that

the histologic changes were observed primarily in the remnants of the lymphatic tissue.

Dietrich³ divides the inflammatory processes in the nasopharyngeal mucous membrane in two groups:

- (1) Inflammatory processes localized in the nasopharyngeal lymphatic tissue;
- (2) Inflammatory processes localized in the mucous membrane of the nasopharynx, the lymphatic tissue remaining uninvaded.

In a manner somewhat similar to Dietrich's arrangement, we suggest the following classification for tuberculosis of the nasopharynx:

- (1) Tuberculosis involving the lymphatic apparatus of the nasopharynx or the remnants thereof;
- (2) Tuberculosis of that part of the mucous membrane without lymphatic tissue, viz., the nasopharyngeal surface of the uvula.

From strictly another point of view, we may distinguish between:

- A. Open tuberculosis of the nasopharynx, or tuberculous ulcers; and
- B. The closed type, which may be discerned only by microscopic examination.

As to the pathogenesis, our cases of miliary tuberculosis signally failed to disclose tubercles in the nasopharynx despite exacting gross and microscopic examination. We believe, therefore, that our observations tend to support Dietrich's view that infection by the hematogenous route is of rare occurrence.

Clinical Significance

Tuberculous disease of the nasopharynx in the course of fibrotic tuberculosis of the lungs is of more practical significance than the frequent incidence of tuberculosis of the nasopharynx in far-advanced fibrocasseous ulcerative tuberculosis of the lungs. It is not far-fetched to assume that the nasopharynx may be the persistent source of reinfection of the lungs. In those patients in whom a negative sputum is impossible to obtain after arrest of the pulmonary involvement, the nasopharynx must be considered as a possible focal site. In fact, from the statistics of our studies, it undoubtedly is the "obscure focus" commonly sought but, in the past, seldom found. It may be assumed that contact inoculation occurred at a time when the patient was still in the fibrocasseous stage, i.e., clinically "open". After the pulmonary process becomes arrested, tuberculosis of the nasopharynx may remain as the active source of reinfection.

COMMENT

Pharyngeal and oropharyngeal tuberculosis have been more commonly recognized than the nasopharyngeal type. The disease does not respect any of the pharyngeal structures in which ulceration is the characteristic lesion. In the oropharynx the diagnosis is not difficult because the lesions can be easily visualized, especially after ulceration has taken place. If visualization of the nasopharynx were equally as simple, lesions in this area would not go unrecognized.

Myerson⁴ believes that in most cases tuberculous ulceration of the pharynx is an indication of severe general disease. It is reasonable to assume that a similar situation obtains when ulceration involves the nasopharynx. The main objective in either instance is to overcome the activity of the lesion, since failure to arrest or cure the local process usually leads to its extension to neighboring membranous structures.

It is difficult to understand why the site of the nasopharynx has not hitherto been investigated for sources of positive sputum. If the reason is lack of facility in approaching or visualizing this area, methods and instruments should be devised to overcome this deficiency.

From what has been said it is clear that the detection of tuberculosis of the nasopharynx is as important to the general clinician as to the rhinolaryngologist. For this reason it goes without saying that in all cases of pulmonary tuberculosis, routine examination must include thorough investigation of the nasopharyngeal cavity.

SUMMARY

1. There are many unsolved problems pertaining to the pathology and pathogenesis of human tuberculosis, and this is especially true of tuberculosis of the nasopharynx.
2. Tuberculosis of the nasopharynx, in our opinion, probably occurs more frequently than tuberculosis of the larynx, at least in autopsy specimens, and that fact was brought out in our pathologic study.
3. In 24 specimens of subjects who expired from pulmonary tuberculosis, nasopharyngeal tuberculosis was demonstrated either grossly or histopathologically in 18, or 75 per cent.
4. There are two types of tuberculosis of the nasopharynx, the open or ulcerous, and the closed which is discernible only by microscopic examination.
5. It is reasonable to assume that the nasopharynx may be the persistent source of reinfection of the lungs.
6. Since the detection of tuberculosis of the nasopharynx is as

important to the general clinician as to the rhinolaryngologist, a plea is made for all routine examinations to include a thorough investigation of the nasopharyngeal cavity.

RESUMEN

1. Existen muchos problemas no resueltos relativos a la patología y patogenia de la tuberculosis humana, y esto es verdad especialmente en la tuberculosis de la nasofaringe.

2. Tuberculosis de la nasofaringe, en nuestra opinión, aparece con mucha más frecuencia que tuberculosis de la laringe, y este hecho fue comprobado en nuestro estudio patológico.

3. De 24 espécimenes de sujetos que fallecieron de tuberculosis pulmonar, se demostró tuberculosis nasofaríngea mediante estudios macroscópicos o histopatológicos en 18, o sea en el 75 por ciento.

4. Hay dos tipos de tuberculosis de la nasofaringe: el abierto, o ulceroso, y el cerrado que es visible sólo mediante el examen microscópico.

5. Es razonable suponer que la nasofaringe puede ser fuente persistente de reinfección de los pulmones.

6. Ya que el descubrimiento de tuberculosis de la nasofaringe es tan importante para el clínico general como para el rinolaringólogo, se insta que todo examen sistemático incluya la investigación completa de la cavidad nasofaríngea.

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Discussion

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I am very happy, indeed, to listen to this very important and timely contribution to our knowledge of the pathology of the nasopharynx, a region of the body which, because of certain difficulties in its examination, I would like to call the terra incognita of otolaryngology.

When one considers the question carefully it is not surprising that the coughing and expectoration of one in the active stages of pulmonary tuberculosis should frequently implant the lesion in the nasopharynx. Drs. Hollender and Szanto state that an implanted tuberculous lesion in the nasopharynx is as frequent and even more frequent than one in the larynx. When one considers the nature of the epithelial covering of the nasopharynx, its vascularity and the presence there of consider-

able lymphoid tissue, this statement is not surprising. The surprising thing is that this particular lesion of the nasopharynx has not been stressed before, for the standard text books of otolaryngology contain very little information on it. Naturally tuberculous lesions of the larynx, pharynx and nasopharynx will be seen much more frequently by the otolaryngologist who services institutions where tuberculous patients are confined than by one who does not.

An ulcerative lesion in the oro-pharynx is quickly uncovered when the mouth and pharynx are inspected. Lesions of the larynx make themselves known by the rather characteristic symptoms of pain and hoarseness but there are no peculiar symptoms of a lesion in the nasopharynx which would call the physician's attention to this region. Unless careful and systematic examinations of the nasopharynx are made with the use of nasopharyngeal mirrors and the nasopharyngoscope with and without cocaineization of the pharynx in patients with active pulmonary lesions the disease of the nasopharynx may easily be missed.

Whether or not the tuberculous ulcer of the nasopharynx can originate by the hematogenous route is really of academic interest only. The implantation of the tubercle bacillus by the sputum of the patient is the important consideration. The point made by the essayists that the nasopharyngeal ulcer may easily be a focus for the re-infection of the patient is very well taken.

I have very greatly enjoyed hearing this paper and its authors are to be congratulated on an important contribution to our knowledge of tuberculosis in general.

Discussion

ANDREW L. BANYAI, M.D., F.C.C.P.

Wauwatosa, Wisconsin

I should like to compliment Dr. Hollender upon his excellent paper. I feel that this is an important contribution to the knowledge of tuberculosis of the upper air passages.

I should like, however, to comment upon another approach—namely some therapeutic aspects of tuberculous infection in the upper respiratory tract. These remarks are based upon experience with topical application of cod liver oil to tuberculous ulcers. This method of treatment has been used at Muirdale Sanatorium since 1934. There are several factors presumably responsible for the therapeutic action of cod liver oil:

1. The oil is sterile in its natural state. It is bacteriostatic and bactericidal. Bacteria ordinarily encountered in infected wounds, such as streptococci, staphylococci, and *Bacillus coli* perish when introduced into cod liver oil.
2. Cod liver oil increases the metabolic rate of leucocytes.
3. It reduces the toxicity of the pus.
4. It accelerates the liquefaction of dead tissues.
5. It stimulates granulation.
6. It accelerates epithelization.

The favorable results attained in clinical practice were subsequently confirmed by animal experiments. Loehr and Unger reported their observations on 500 guinea pigs, stating that cod liver oil was effective in accelerating the healing of wounds. They attributed this favorable influence to vitamins A and D that are capable of acting as catalyzers

in the oxidizing process of tissue cells. Peustow, Poncher, and Hammatt demonstrated that burns in guinea pigs and rabbits healed 25 per cent faster under cod liver therapy than with tannic acid. Also the experimental studies of Davson are of great practical significance. He found that the tissue response to the topical application of cod liver oil consists in a considerable polymorphonuclear infiltration and active capillary congestion with infiltration by plasma cells, monocytes, and fibroblasts. He found that the fibroblasts penetrate the tissues deeply and that the proliferation of the fibroblasts is associated with a corresponding increase in the capillaries. He concluded from his histological observations that the application of cod liver oil to the wound surfaces promotes the process of repair and healing.

Concerning the effect of cod liver oil upon the tubercle bacillus Williams and Forsyth carried out a series of laboratory investigations as early as 1909. They mixed cultures of tubercle bacilli with various fats and oils, including cod liver oil, and studied the staining characteristics of the bacilli after incubating the cultures for two weeks to two months. It was found that under the influence of cod liver oil there was a disintegration of the waxy capsule of the tubercle bacillus with a consequent diminution in its acid fastness. Fontes reported in 1921 that the addition of 1 per cent cod liver oil to ordinary broth medium prevented the development of cultures of tubercle bacilli. Campbell and Kiefer cultivated tubercle bacilli on potato medium soaked with cod liver oil. They observed that these micro-organisms were not able to grow when transplanted and that they lost their capacity to produce tuberculosis in guinea pigs. When examined under the microscope definite degenerative morphologic changes and involutinal manifestations were observed. Also a few years later Platonov concluded from his laboratory studies that cod liver oil exerts an inhibitory effect upon the growth of the tubercle bacillus. He added the unsaturated soaps of cod liver oil to cultures of tubercle bacilli on potato medium. After three weeks it was found that unsaturated soaps, even in concentrations of $\frac{1}{4}$ per cent inhibited the growth of the bacilli.

We feel that the therapeutic application of cod liver oil to tuberculous lesions in the upper air passages is supported by pertinent laboratory and experimental studies as well as by clinical observations dealing with the treatment of tuberculous surface lesions outside of the respiratory tract. Cutaneous ulcers produced in experimental animals by the injection of tubercle bacilli healed completely under the daily application of cod liver oil in 12-31 days. Healing by this treatment of tuberculous lesions of the skin, lymph nodes, larynx, and urinary bladder has been recorded.

In our work we used the ordinary commercial brand of cod liver oil. The oil is always sterile in its natural state, therefore further sterilization is unnecessary.

Recently, because of the scarcity of standard cod liver oil, we have used a mixture of vegetable and fish oils. This mixture contains 25 per cent cod liver oil. It is assayed to contain 1800 units of vitamin A and 180 units of vitamin D per gram. The therapeutic results with this mixture are satisfactory.

The oil must be kept in contact with the diseased area as continuously as is compatible with the patient's comfort. Training the patient in the proper application of the oil is an essential part of the treatment.

Cod liver oil is not irritating when applied to ulcerating tuberculous lesions.

The stages of a favorable therapeutic response are:

The disappearance of the mucopurulent inflammatory exudate;

The diminution of perifocal congestion and edema;

The formation of granulation tissue;

Epithelization and complete healing.

The time necessary for healing depends of course upon constitutional factors such as general resistance and immunity. It also depends upon the location of the lesion and upon the extent of the destructive pathologic process. The more accessible the lesion, the earlier may improvement be expected. Superficial ulcerating tuberculosis of the mucous membrane may heal in four weeks.

It should be mentioned that there is relief of pain shortly after the beginning of the topical application of cod liver oil.

Discussion

EDWIN R. LEVINE, M.D., F.C.C.P.

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I have been very interested in Dr. Hollender's discussion of tuberculosis of the nasopharynx. The significance of lesions in the oral and nasal cavities has not been generally recognized; and the examination of this region, which is so generally neglected, has very obviously a degree of importance which makes that neglect reprehensible. That tuberculosis exists in the nasopharynx we have known, but that it should be found in such a high percentage of tuberculous cases as reported by Dr. Hollender is nothing less than startling. However, speaking as a clinician, it occurs to me that these figures were secured in autopsy specimens; and I think that a word on the question of differences in incidence of lesions from the clinical and postmortem standpoint is indicated.

The average figure for laryngeal involvement, as generally accepted, is approximately 10-15 per cent and yet Shaffer in the early days of this century reported 97.4 per cent of laryngeal involvement. This marked difference is due to the difference in clinical and postmortem examinations. Myerson states that the "incidence of laryngeal tuberculosis in postmortem examination is usually higher than that of cases observed clinically. . . . Studying larynges until a few days before death, we have been astonished at the great difference between the premortem and the postmortem appearances. Larynges, which were free from disease during life, have been found to be considerably involved at the autopsy table."

Furthermore Katz reported a 19.9 per cent incidence of tuberculosis of the tongue on careful autopsy investigations, whereas at the same institution the clinical incidence of this lesion was found to be 0.32 per cent. We are led to the unavoidable conclusion that there are immediate premortem changes which produce the picture of this widespread lesion found at the autopsy table, and which are responsible for the high incidence of certain pathological lesions.

It would appear that this rapid premortem dissemination of tubercle bacilli with the consequent production of new lesions, is the result of a very marked change that occurs in the tissues of an individual. We

are aware that allergy frequently disappears in these last few days, and that it may be that despite the opposite experience in experimental work this anergic state is associated with hematogenous dissemination. Whatever may be the cause, the parallel between these definite premortem changes and similar lesions seen clinically appears to be borne out by the observation that the majority of patients having lesions in the oral and nasal cavities have little life expectancy. Generally speaking, a lesion of the tongue or pharynx is associated with a very bad prognosis. I believe that some part of the incidence reported by Dr. Hollender might be interpreted in the light of immediate premortem changes. Nevertheless, you cannot explain away lesions occurring with such a high frequency on a theoretical ground in the absence of clinical statistics. I believe that we should make this type of examination a routine on all admissions and part of our regular follow-up, and only by that means will we discover whether the incidence during life is as high as reported in this paper. I intend to have such examinations done as a routine, and I am very grateful to Dr. Hollender for bringing this matter to my attention.

Irreversible Allergy in Non-Tuberculous Diseases of the Chest*

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The term allergy as used in this discussion is defined as a specifically acquired altered reaction capacity of the tissues. This is the original definition of Pirquet. Knowledge of the development of allergy and the reactions associated with it are essential for an understanding of many disease processes.

When a cell is brought into contact with an antigen for the first time no specific reaction occurs. This contact however, initiates a profound change in the cell. After an incubation period of from 7 to 14 days the cell will have developed antibodies which are capable of reacting with the antigen. If at this time, and for many days thereafter, a second dose of antigen reaches this cell the antigen is bound by the antibody. This combination of antigen and antibody with the cell results in the formation of a poisonous substance which diffuses into the surrounding tissues and sets up an inflammatory reaction. This inflammation disturbs the physiology of the part and thus produces symptoms.

Allergic reactions can be divided into two major groups as follows: Group I, those initiated by non-living plant and animal foreign proteins and drugs, and Group II, those initiated by living organisms in the infectious diseases.

The reaction in Group I is a hive which has a characteristic histological picture. Its development has been studied in biopsies removed from the skin after the injection of ragweed and other antigenic materials. Within 10 minutes after such an injection, there will be edema in the epidermis and dermis with extravasation of cells from the blood stream through the walls of the blood vessels into the tissues. In sections of tissues removed up to 60 minutes after the induction of the reaction, the predominant cell in the inflammatory exudate will be found to be the polymorphonuclear eosinophile. In sections of tissues removed later and up to 22 hours the eosinophiles will have disappeared. The predominant cell will then be the polymorphonuclear neutrophile. In addition, lymphocytes and mononuclear wandering cells will be present. The changes present in sections of tissue removed later than one hour after the inception of the reaction cannot be dis-

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tinguished as typically allergic reactions of Group I. They are then indistinguishable from other inflammatory reactions.

This characteristic histological picture of the reaction in Group I is the same for all antigens inducing it. For this reason the poisonous material formed must be derived from the reacting tissues. *These reactions are body specific in type.*

Allergic reactions in Group II are also inflammatory in nature. In these, however, in contradistinction to those occurring in Group I, the poisonous material is freed in part from the antigen. For this reason the inflammatory exudate and the picture of the reaction differ widely among the various infections. In tuberculosis the characteristic reaction produces a tubercle; in syphilis, a chancre or a gumma; and in pyogenic infections, an abscess. *These are antigen specific reactions.*

Both body specific (Group I) and antigen specific (Group II) reactions may vary in intensity from very mild to very severe. They may cause no tissue destruction, being completely reversible, or they may lead to tissue death with replacement fibrosis. They are then irreversible. There is always some reversible allergic change around an area which is irreversibly damaged. This is well illustrated in the tubercle where there is central tissue death surrounded by an area of proliferation which is reversible; and in the lesions of periarteritis nodosa.

One of the most common allergic diseases is bronchial asthma. In this disease one sees classical examples of both reversible and irreversible allergic reactions occurring in the bronchial wall and occasionally in the pulmonary parenchyma. In most cases of asthma the attacks are periodic and there are periods of complete freedom from symptoms between them. In these cases the antigens which induce the reaction are in contact with the patient only at periodic intervals as for example in pollen asthma. The reactions are almost completely reversible and one may see such asthmatics of many years standing without evidences of organic change in the chest and with normal vital capacity between the attacks.

There is a type of asthma however, which is classified as intrinsic which runs an entirely different course. It begins around the age of 40 with dry spasmodic cough. In many patients nasal symptoms like those of vasomotor rhinitis are present for several years before the inception of the cough. The cough gradually becomes more paroxysmal in type and varies in intensity so that there are days of relative freedom and periods of severe symptoms. There is seldom a day in which no cough occurs. After the cough has been present for a few months in a characteristic case, wheezing begins and after a varying period of cough with wheezing the first sharp attack of bronchial asthma comes on. From this time on the asthma

becomes more frequent and more severe. Nasal and sinus polyposis, emphysema and cylindrical bronchiectasis develop rapidly. It is not unusual to find the vital capacity, after relief of the attack by epinephrine to be from 50 per cent to 60 per cent of normal even in early cases. The course is down hill; many of the patients die within 3 to 10 years, in an attack of asthma, from congestive failure due to cor pulmonale, or from periarteritis nodosa.

The pathology of intrinsic asthma is identical with that described above for allergic reactions in Group I. The reactions are, however, much more intense because of either a higher degree of allergy or more frequent and larger contacts with the antigen.

Urticarial reactions which occur in the bronchial mucosa narrow the lumina of the bronchi. Mucous which is poured out in large amounts further obstructs the air passages and dyspnea occurs. Ball valve action of the mucous plugs causes air to be trapped and acute emphysema results. As the attack continues there is a tendency for the mucous plugs to become inspissated and many small areas of atelectasis occur. Most of these are re-aerated as the plugs are moved by cough, but some remain; the atelectatic areas become fibrosed. This accounts for the linear fibrotic changes so often seen in the lungs of patients who die in bronchial asthmatic attacks.

In intrinsic asthma with almost continuous attacks, allergic reactions occur over and over again in areas which have not completely recovered from the preceding ones. This chronic inflammatory reaction leads to mucoid degeneration of the cells lining the mucous membrane and to fibrinoid degeneration of the walls. In many areas both in the walls of the blood vessels as well as in the surrounding tissues the reactions are completely irreversible and tissue death with scarring results. It is these changes which produce the dilatation and distortion of the bronchi which are seen so commonly in roentgenograms of the chest in this condition. The vascular changes produce hypertension in the lesser circulation with subsequent enlargement of the right ventricle, the prelude to cor pulmonale and right heart failure.

The changes which have been described as involving the bronchi in intrinsic asthma may also affect the pulmonary parenchyma, the pleura and pericardium. Loeffler's syndrome, some cases of Pick's disease and most cases of periarteritis nodosa result from such allergic reactions.

From the foregoing discussion it can be seen that we must extend our ideas of the causative factors in inflammatory lesions. That non-living, non-toxic substances may produce structural changes and serious disease, through the mechanism of allergy, must be accepted. Further extension of our knowledge will result from appreciation of this concept.

SUMMARY

Allergy is defined as a specifically acquired altered reaction capacity and a knowledge of its development, nature and reactions is essential for an understanding of many disease processes. Allergic reactions can be divided into two major groups: Group 1, initiated by non-living plant and animal foreign proteins and drugs, and Group 2, initiated by living organisms in the infectious diseases.

The characteristic reaction in Group 1, is a hive whose development differs from ordinary inflammation in that its early predominating cell is the eosinophile. The reaction in this group is the same for all antigens producing it: the poison must accordingly be derived from the reacting tissues: hence it is *body specific* in type.

The reaction in Group 2 differs in that the poison is derived in part from the antigen. The reaction accordingly is not always the same, varying with the antigen and producing a variety of lesions such as the tubercle, the chancre and gumma and the abscess: hence it is *antigen specific* in type.

Both reactions may be mild and reversible or severe and irreversible with resultant replacement fibrosis of the necrotic tissue. A common disease in which both reversible and irreversible allergic reactions occur is ordinary bronchial asthma. In so-called intrinsic bronchial asthma, the reaction is of the Group 1 type, but much more intense, and the disease runs a progressively fatal course. The bronchi are narrowed by urticarial reactions as well as inspissated mucous plugs and become dilated and distorted. Fibrinoid degeneration takes place in the walls. Eventually vascular changes produce hypertension and cor pulmonale with right heart failure.

Loeffler's syndrome, some cases of Pick's disease and most cases of periarteritis nodosa also result from such allergic reactions.

Through the mechanism of the allergic reaction, non-living ordinarily non-toxic substances have the capacity to produce serious disease.

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RESUMEN

La alergia es una alterada capacidad de reacción, específicamente adquirida, y el conocimiento de su desarrollo, naturaleza y reacciones es esencial para la comprensión de muchos procesos morbosos. Las reacciones alérgicas pueden ser divididas en dos grupos principales: el Grupo 1, iniciadas por proteínas no vivientes de origen vegetal y animal, y drogas; y el Grupo 2, iniciadas por gérmenes vivos en las enfermedades infecciosas.

En el Grupo 1 la reacción característica es la urticaria cuya evolución difiere de una ordinaria inflamación en que la célula

primitiva predominante es el eosinófilo. En este grupo la reacción es idéntica con todos los antígenos que la producen. De manera que el veneno debe derivarse de los tejidos reactivos y la reacción es, por consiguiente, del tipo *cuerpo específico*.

En el Grupo 2 la reacción se diferencia en que el veneno en parte se deriva del antígeno. De manera que la reacción no es siempre la misma, sino que varía de acuerdo con el antígeno y produce una variedad de lesiones, tales como el tubérculo, el chancre y la goma y el absceso, y es, por consiguiente, del tipo *antígeno específico*.

Ambas reacciones pueden ser moderadas y reversibles o severas e irreversibles con la resultante fibrosis de reemplazo del tejido necrótico. El asma bronquial ordinaria es una enfermedad común en la que tienen lugar reacciones alérgicas reversibles e irreversibles. En la llamada asma bronquial intrínseca, el tipo de reacción es del Grupo 1, pero mucho más intensa, y la enfermedad prosigue un curso progresivo fatal. Reacciones de urticaria y tapones mucosos espesos causan estrechamiento de los bronquios y, más tarde, dilatación y deformación. Las paredes bronquiales sufren degeneración fibrinoidea. Finalmente, las alteraciones vasculares producen hipertensión y *cor pulmonale* con insuficiencia del ventrículo derecho.

El síndrome de Loeffler, algunos casos de la enfermedad de Pick y la mayor parte de los casos de periarteritis nodosa también se deben a estas reacciones alérgicas.

Algunas sustancias no vivientes y ordinariamente no tóxicas pueden producir enfermedades graves por el mecanismo de la reacción alérgica.

Surgical Closure of the Patent Ductus Arteriosus*

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The patent ductus arteriosus was first described by Galen.¹ No thought was given to the surgical treatment of patients with persistently patent ducti until 1907, when Munro described a technique for their ligation. It was not until twenty-one years later that Gross of Boston successfully ligated a patent ductus arteriosus for the first time.

Since the epochal operation by Gross² increased attention has been given to the surgical treatment of patent ductus arteriosus in America. The field has been further extended from that of a noninfected case to include surgical cure of cases of subacute "Streptococcus Viridans" endarteritis associated with patent ductus arteriosus. More recently additional cases of patent ductus arteriosus with other congenital heart disturbances which have been successfully treated surgically have been reported.^{3,5,6}

In fetal life the ductus arteriosus serves the important function of shunting blood from the pulmonic artery to the aorta thus by-passing the lungs. When the child is born, the lungs expand and the ductus normally closes. The blood in the pulmonary artery then passes through the lungs to be aerated. If the ductus fails to close the patient then possesses a persistently patent ductus arteriosus which is essentially an arteriovenous aneurysm.

There is considerable difference of opinion as to the time in which a patent ductus arteriosus closes under normal conditions. According to Christi⁴ in a study of routine autopsy specimens from infants, at eight months only 2 per cent of the ducts remained open. Gross⁷ sets an arbitrary time limit of one year, believing that an open ductus after that time should be regarded as being abnormal. In discussing the etiology of a patent ductus arteriosus, Gross points out three interesting possibilities to be considered. Of these, the most important is the position and direction of the vessel. The ductus usually enters the aorta at an acute angle, and as the acuteness of the angle decreases, the ductus becomes more and more exposed to intra-aortic pressure. If the angle becomes a right, or even an obtuse angle, the force of intra-aortic pressure

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can readily be exerted to maintain patency of the lumen of the ductus. Gross has repeatedly observed this deviation from the usual acute angle in his operative experiences. The second possibility is a defect in the elastic fiber of the media, decreasing the contractibility of the ductus. A third possibility is a deficient neurovascular tonus. The discussion of these possibilities does not apply to cases in which another congenital defect acts to maintain an open ductus arteriosus as a compensatory mechanism.

Maude Abbott,⁸ in a series of 1000 autopsies, has shown that the patent ductus arteriosus may be accompanied by other congenital abnormalities; consequently, these pathological combinations must be taken into consideration in the differential diagnosis of patent ductus arteriosus. On the other hand, it must be remembered that a patent ductus arteriosus can, and does, exist as a single cardiac anomaly; and in most such cases presents sufficient hazards that operation is not only a justifiable procedure, but is definitely indicated.

Eppinger and Burwell,⁹ with Gross,¹⁰ studied the effects of the patent ductus on the heart and circulation before and after ligation of the ductus. It was observed that the blood flow is from the aorta to the pulmonary artery in the presence of a patent ductus. No flow takes place from the pulmonary artery to the aorta; hence, the patient is not cyanotic. Studies clearly show that a tremendous strain in the presence of a patent ductus arteriosus is imposed upon the heart which explains the frequent occurrence of cardiac decompensation and circulatory failure among patients having this lesion. This may also cause a diminution of the blood flow to the peripheral vascular system.

The hazards of a patent ductus arteriosus are further demonstrated by studies of the life expectancy of such patients. In ninety-two cases cited by Maude Abbott,¹¹ the mean age of death was twenty-four years. However, the mean age in her series is somewhat confusing since twenty of the patients died in infancy. A review of eighty cases, in which all patients were over three years of age at the time of death and each diagnosis was proved by autopsy, was made by Jones, Dolley and Bullock.¹² They presented the following statistics:

By fourteen years of age, 14 per cent died of their heart lesion.

By thirty years, 50 per cent died of their heart lesion.

By forty-one years, 71 per cent died of their heart lesion.

Both Gross¹⁴ and Maude Abbott^{11,13} have pointed out the alarming fact that the incidence of subacute endocarditis is in the neighborhood of 25 per cent. Aside from cardiac decompensation,

other possible complications are bacterial endocarditis or endarteritis, aneurysmal dilatation of the ductus, rupture of the ductus, and possible retrograde thrombosis with release of emboli to various parts of the body. In one of our cases an aneurysm of the pulmonary artery associated with a patent ductus arteriosus was encountered. Thus, it is apparent the surgeon must approach this surgical entity with the realization that he may encounter numerous abnormalities other than a patent ductus arteriosus alone.

The patent ductus arteriosus is seldom recognized during the first few years of life. Usually, however, when the child progresses to the period of physical activities, symptoms of dyspnea, increased heart rate, or a pounding heart may develop. As the age of the patient advances, shortness of breath and pounding of the heart on slight exertion is a rather persistent complaint and may be the first symptom to lead to the recognition of a patent ductus. It is important to realize that cyanosis is *not* present except as a terminal symptom of impending death. The patient may present evidence of being undernourished, but if a ductus remains patent until early adult life, the patient is apt to become more normally developed. Perhaps the most determinative factor in diagnosis is the so-called "machine" murmur to be found at the pulmonic area in the second or third interspace to the left of the sternum. This murmur is transmitted to the left axilla and can be heard, in many instances, toward the back. Although a thrill does not exist in every case, it is usually present, and its existence is to be considered one of the chief diagnostic points. In one of our cases, no thrill could be felt through the chest wall, but it was readily palpable when the thorax had been opened. Patients complain of a humming sound in the chest and an annoying thumping in the ears upon lying down. There are some extreme cases in which the murmur may be heard by individuals standing near the patient. The mother of one of our patients stated that the murmur of her child was so pronounced it was audible to her when she slept with the child. The blood pressure is another sign of importance. The systolic level is normal or slightly lowered, while the diastolic level is greatly decreased. The Corrigan pulse and the pistol shot sounds may be detected in the peripheral arteries when the pulse pressure is high. Percussion shows a heart of normal or slightly increased size. The electrocardiogram, as a rule, is not diagnostic.

Roentgenological studies reveal a large pulmonary conus, and may further reveal congestion of the opposite lung in the region of the hilus, although neither of these signs is persistent during early childhood. The x-ray findings serve as important contributory evidence, rather than as a basis for diagnosis.

Selection of Cases

Gross¹⁵ has stated that the various hazards are sufficiently serious and appear frequently enough to make surgical closure of a patent ductus arteriosus advisable, provided this can be accomplished with a reasonably low mortality rate. There are, of course, some cases where contra-indications to operation exist. Touroff¹⁵ mentions two absolute operative contra-indications. First, in those cases where there is incontrovertible evidence that the open ductus is present as a compensatory mechanism for some other co-existing congenital cardiovascular anomaly, ductal ligation quickly leads to circulatory embarrassment and death. Second, where there is strong evidence that vegetations already have spread to the endocardium, aorta, or to the mitral or aortic valves, ductal ligation is of no value for the reason that new lesions continue to feed infective material directly into the peripheral blood stream. However, he emphasized that the presence of an infection of long duration does not necessarily constitute a contra-indication to operation unless vegetations already have spread to the above mentioned areas.

Operation

The operative technique of most surgeons is similar to that employed by Gross,^{2,7,14,17} except in certain details. The incision we employ begins at the lateral border of the sternum and extends laterally for a distance of five to six inches over the second interspace. Munro,¹⁹ in 1907, first suggested the possibility of ligating a patent ductus arteriosus through a sternal approach. Although Gross cuts the second and third cartilages to obtain better exposure, we have found this unnecessary. It is possible to obtain adequate exposure without cutting the rib structure by placing a rib spreader between the second and third ribs. Certain anatomical relations are to be observed in identifying the duct. A sentinel lymph node lies at the superior border of the base of the lung, and from the lymph node the incision is extended upward through the mediastinal pleura. The aorta, which has a tough wall, can be easily and safely identified by rather firm dissection. In contrast to the aorta, it is well to remember, the ductus has a thin wall and must be freed with care. In fact, several cases have been reported where the ductus was torn during the operation with fatal results.^{10,19,20} The vagus nerve is identified and traced to its recurrent laryngeal branch which courses medially under the ductus. The area of maximum thrill which lies directly over the ductus is then sought by palpation with the tip of the index finger. By following these steps, it is possible to quickly and confidently identify the ductus arteriosus except in cases in which

other anomalies exist. Such an exceptional case came under our observation in the form of a patent ductus arteriosus associated with a large aneurysm of the pulmonary artery. In this patient, either because of the expansile pressure of the aneurysm or because of the congenital anomaly, the pericardium, instead of being attached to the pulmonary artery as is normally the case, was attached to the inferior surface of the aorta; thus making it necessary to open the pericardium in order to expose the ductus.

The danger of cutting through the ductus, if the ligature is tied too tightly, is pointed out. Mont Reid²¹ advocated the umbilical tape ligature of woven silk 5/32 inch in breadth. Gross¹⁵ has supplemented the use of a ligature of cellophane placed over the silk ligatures. Herman Pearse¹² of Rochester, New York, has found through experimental work that cellophane increases the proliferation of fibrous tissue. Sclerosing fluid injected into a short segment of the ductus isolated by two ligatures has been employed by Gross.¹⁴ More recently Gross¹⁵ has reported a series of fourteen cases in which complete surgical division of the patent ductus arteriosus was successfully achieved. Touroff¹⁶ has stated that in his experience he had found ductal ligation to be similarly effective to ductal division. Our experience with ligation has been similar to that of Touroff. We have had excellent results and no complications by tightly, doubly ligating the ductus with No. 8 braided silk.

Following the ligation of the duct, the machine murmur is usually converted to the sound of a normal heart. However, some cases have been reported in which a residual murmur can be heard.^{15,23} There is an immediate cessation of the thrill, and the violent action of the heart is toned down; thus indicating the heart was carrying an additional load in the presence of a patent ductus arteriosus. A rapid improvement in weight and good health is noticeable in the undernourished and underdeveloped patient. The diastolic blood pressure, which is low in these cases is immediately elevated.

Dramatic results may be obtained in cases of subacute Staphylococcus endarteritis associated with a patent ductus arteriosus. Since the mortality rate of approximately 100 per cent for untreated cases with associated endarteritis has been reduced to less than 50 per cent by ligation, as pointed out by Burch,²³ it would seem that surgical treatment should be urged in such cases. In a successful case reported previously,²⁶ the patient had been confined to her bed with an elevation of temperature and a repeatedly positive blood culture. A blood specimen taken twenty-two minutes after the duct was ligated showed a negative culture. Other similar cases have been reported by Touroff,¹⁶ Harrington,²⁵ and Shapiro and Keys.²⁰ No clear explanation has been advanced as to why

the blood culture taken shortly after the operation was sterile.

Aside from the usual complications of any thoracotomy, such as sepsis, pneumonia, and post-operative thrombosis, there are others which may occur during the operation for ligation of a patent ductus arteriosus:

- 1) Inability to identify the duct;
- 2) Injury to the duct during ligation;
- 3) Incomplete occlusion or perforation of the ductus by ligature;
- 4) Injury to the recurrent laryngeal nerve.

In one of our cases in which the ductus lay within the pericardium, the recurrent laryngeal nerve was injured during the rather extensive dissection which was carried out in an effort to locate the ductus. The patient developed a hoarse voice post-operatively, but within five weeks her voice had become normal. During the first thirty-six hours post-operatively the patient is likely to develop sufficient pleural effusion to produce a certain degree of respiratory embarrassment. This is easily relieved by the use of the aspirating needle.

Although the length of time since most of these operations have been performed is too short to offer conclusive evidence as to the degree of permanence of the cure, the results are sufficiently beneficial to warrant continued interest in surgical treatment of such cases.

SUMMARY

The function of the ductus arteriosus before birth is explained, and the reasons for its remaining patent after birth are given.

Symptoms and diagnostic points are discussed, and the operative technique and results of the ligation of a patent ductus arteriosus are described.

Statistics of the cause of death of untreated cases are presented together with numerous abnormalities and complications which may be encountered during the ligation of a patent duct.

RESUMEN

Se explica la función antenatal del *ductus arteriosus*, y se presenta las razones por las cuales puede permanecer abierto después del nacimiento.

Se discute síntomas y puntos en el diagnóstico, y se describe la técnica operatoria y los resultados de la ligación del *ductus arteriosus* abierto.

Se presenta datos estadísticos relativos a la causa de muerte en casos no tratados, así como numerosas anomalías y complicaciones que se puede encontrar durante la ligación de un *ductus* abierto.

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Discussion

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Doctor Nixon's paper on patent ductus arteriosus is both timely and interesting. It is especially timely, I think, because it is a subject on which a great deal of thought and consideration is being given right now. In the past, to most of us, patent ductus arteriosus just fell into that general classification of congenital heart, and it was only of interest when it came to the post-mortem table. Now, we know that it is not enough to make a diagnosis of congenital heart and leave it at that. We should go much further in an attempt to make an accurate differential diagnosis because in the case of patent ductus arteriosus we may have something definite and worth-while to offer the individual, thus changing a bad prognosis as to longevity to a much better prospect of living a normal life.

However, let me stress right here the importance of making an accurate diagnosis, because even in the best clinics post-mortems have shown a rather high percentage of error. Dr. M. J. Shapiro, Clinical Director of Children's Heart Hospital and Clinic of Minneapolis, Minnesota, suggests nine steps which I think are worth mentioning here:

1. History of heart disease from birth or early childhood.
2. No cyanosis or clubbing of the fingers.
3. Stunting of growth, in a small percentage of cases.
4. Probable thrill over the pulmonic area.
5. Characteristic machinery murmur, or the humming top murmur, over the second left interspace.
6. Increased pulse pressure.
7. Normal electrocardiogram.
8. Probably enlarged heart.
9. Enlargement of pulmonary artery and branches.

In these last three points, of course, an expert roentgenologist experienced in chest diagnoses, particularly of children, would be a great help.

So, I feel that Dr. Nixon's paper is of special interest because it emphasizes our duty as chest men to try to make an exact diagnosis in congenital heart disease, since we know from Dr. Maude Abbott's work on congenital cardiac disease that there may be more than one defect present. Therefore, when a patent ductus arteriosus is found to be the condition and we have carefully eliminated, to the best of our ability, other congenital defects, then, I feel, these cases should have the benefit of ligation by a good thoracic surgeon.

Pulmonary Embolism*

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Pulmonary embolism is an affection of the lungs which is commonly overlooked. Recognition of its frequency and the possibility of its recurrence will enable the physician to avoid failure in its diagnosis. The signs and symptoms especially the triad, hemoptysis, chest pain and fever associated with this disorder are too familiar to a group of chest physicians to warrant discussion. The value of x-ray examination and the presence in many cases of characteristic electrocardiographic findings should be stressed. Even in the absence of these characteristic findings, the presence of an unstable electrocardiogram in *seriatim* curves taken a few days apart may be helpful.

Not every instance of pulmonary embolism leads to pulmonary infarction nor to acute cor pulmonale. Apparently for pulmonary infarction to occur, there must be some chronic pulmonary congestion. This means pre-existing heart disease with left heart strain or heart disease associated with mitral involvement, usually rheumatic in origin. Pulmonary emboli are often multiple so that the first attack should suggest the possibility of subsequent ones, and therapy should consequently be directed to prevent the latter, and the hazard of unexpected death.

While it is customary to consider pulmonary embolism as a post-operative hazard occurring particularly in operations in the pelvis which lead secondarily to the formation of thrombi in the large veins of the leg, it is often found in the absence of operative procedures. Medical conditions leading to pulmonary embolism often result from thrombi in peripheral veins notably those of the leg. This may accompany varicose veins, infected hemorrhoids, thrombophlebitis or other conditions less well defined. The frequency of the latter is much greater than clinical examination reveals because of involvement of the deep veins. Pulmonary emboli occur frequently in heart disease. Peripheral venous thrombosis is not uncommon in congestive heart failure and may be the source of embolism. The embolus may originate from a thrombus superimposed upon a recent or old myocardial infarct extending to the

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septal or lateral wall of the right ventricle. More frequent, however, are emboli coming from thrombi in the right auricle associated with congestive heart failure and dilatation of this chamber; this is especially frequent in the presence of auricular fibrillation. Rarely such emboli may occur paradoxically from the left side of the heart in the presence of a wide-open foramen ovale, a common congenital anomaly. Occasionally, the emboli may arise from vegetations on the heart valves, particularly in the presence of the large and friable vegetations of subacute bacterial endocarditis.

Pulmonary emboli may be classified in three categories according to size: 1) the large snake-like embolus which rides the bifurcation of the pulmonary artery or plugs up the main right or left pulmonary artery; 2) the emboli of intermediate size which occur in showers and plug up the smaller pulmonary arteries; and 3) the more minute emboli, also occurring in showers, which plug up the arterioles.

Often the clinical symptomatology and the clinical signs in pulmonary embolism appear to be out of proportion to the amount of circulation cut off by the emboli as demonstrated at necropsy. It is for this reason that the possibility has been seriously considered that these emboli, acting as foreign bodies, set up a pulmonary vasoconstriction, reflex in origin, a pulmono-pulmonary reflex. In this manner one can satisfactorily explain the striking clinical effects of what would be otherwise minor pulmonary occlusions. However, in some cases the effects may be ascribed to the presence of frequent premature beats or paroxysmal tachycardia which develop reflexly from pulmonary emboli, particularly in a heart which has a pre-existing impairment. Sometimes an irreversible ventricular fibrillation may occur in a reflex manner leading to sudden, unexpected death. Apparently the pulmono-pulmonary reflex and the reflex cardiac ectopic rhythms involve the efferent vagus pathways. It is for this reason, I believe, that atropine has proved to be such an effective therapeutic agent.

Experimental studies carried out on the dog in my department failed to reveal any evidence of a pulmono-coronary reflex leading to coronary spasm. This commonly employed explanation for the ill-effects of pulmonary embolism is, in my opinion, without foundation. In fact our results demonstrated that the vagi are not coronary constrictors at all, if the results on dogs can be transposed to man, but are in reality coronary dilators. Coronary insufficiency, inadequate coronary flow, does occur in pulmonary embolism and coronary patterns are seen in the electrocardiogram. This can be explained on purely mechanical effects. With the tremendous increase in resistance in the pulmonary bed following pulmonary embolism there often develops a shock-like picture

associated with a decrease in arterial pressure and in cardiac flow, both of which cause a reduction of the coronary blood flow. At the same time the pressure in the right auricle and ventricle is greatly elevated leading to an impediment of coronary drainage. This decrease in coronary flow is not accompanied by a commensurate decrease in the work of the right heart; in fact, in most instances, the right heart labors excessively to overcome the obstruction in the pulmonary circuit. This results in a relatively inadequate coronary flow for the needs of the right heart and this explains the coronary deficiency to which there has been so much reference in the literature.

Furthermore, the work load of the heart is increased by the increased respiration caused by pulmonary embolism. With the larger emboli, this is in the nature of hyperpnea, but with the minute emboli the increased breathing is more in the nature of tachypnea, such as occurs in generalized anoxemia. It is in these cases of small emboli that pulmonary edema and arterial anoxemia are common from the start and in which oxygen inhalation is particularly beneficial. In the presence of large emboli, such edema and anoxemia is delayed and hence early oxygen therapy is not indicated.

Papaverine, in addition to atropine, is a very useful drug in the treatment of pulmonary embolism for several reasons, and should be administered in every severe case. Experimental evidence is clear in showing that papaverine relieves the narrowing of the pulmonary bed; it overcomes the pulmono-pulmonary reflex constriction. Furthermore, papaverine makes breathing slower, less dyspneic and therefore more effective. Papaverine is also a powerful coronary dilator; thereby it tends to make the coronary bed larger and overcomes to a certain extent the relative coronary insufficiency caused by purely mechanical factors. Finally papaverine is a hypnotic, and is therefore effective for sedation.

Heparin and dicumoral are also used in pulmonary embolism to check the continued formation of the thrombi which give rise to repeated attacks. They are useful prophylactically and hasten healing of possible thrombophlebitis.

It must be pointed out that the cardiodynamic effect of pulmonary emboli is a function of the amount of the pulmonary bed occluded. It can be shown experimentally that obstructing up to about 50 per cent of the pulmonary circulation has little influence upon the circulation, but each increment beyond this has a progressively greater and greater effect. In short, the difference between 30 and 40 per cent pulmonary occlusion is insignificant, that between 50 and 60 per cent of tremendous significance. It must also be borne in mind that once emboli are established, they

tend to grow by thrombotic accretion and thus the effects may be progressively aggravated.

Recently we became interested in the site of origin of the reflex causing dyspnea. Since a riding embolus causes dyspnea, the reflex cannot originate exclusively in the alveolar walls or in the smaller pulmonary arteries, although these localities no doubt contribute to the production of the respiratory disturbance in the case of medium and minute pulmonary emboli. We have found that in the dog artificial emboli lodging in the right ventricle or obstructing the inferior vena cava do not lead to dyspnea as do the riding pulmonary emboli. On the other hand, an embolus lodging at the mouth of the superior vena cava as it enters the right auricle does give rise to dyspnea. This suggests that this region of the superior vena cava is the site of origin of the respiratory disturbance. This was clearly proven in experiments in the dog in which we distended the root of the superior vena cava under fluoroscopic control by means of an umbrella-like cannula or a Morawitz-like cannula without interference with the blood flow through the heart. We therefore have come to the conclusion that dyspnea in pulmonary embolism, and incidentally in other forms of right heart strain, causes respiratory disturbances, to a large extent, by distention of the root of the superior vena cava where it enters the right auricle. In this locality, many sensory end-organs have been demonstrated recently. This does not deny the role of reflexes from the lungs and the pulmonary arteries in causing respiratory disturbances, but points clearly to this locality as an important element in the causation of dyspnea in pulmonary embolism.

Except in the instances in which ventricular fibrillation occurs, death in pulmonary embolism is not instantaneous. In experiments with dogs we have found, in fatal cases, that death occurs in a matter of minutes or hours, and in these a progressive decrease in cardiac output develops. On the basis of our work, we feel that the more severe the occlusion, and the lower the cardiac reserve, the more apt is the patient to go into shock. This shock is in reality a manifestation of severe forward failure associated with a sharp drop in cardiac output, in arterial blood pressure and in venous pressure. In short, the shock picture is initiated by an acute dissipation of the energy of the right heart in overcoming the pulmonary obstruction so that little energy is left to propel the blood through the circulatory tree. It is shock *sui generis*. Once initiated the changes are no different in this form of shock than those of peripheral origin.

However, not all cases of pulmonary embolism develop shock; others, in which occlusion is less severe and in which there is a greater cardiac reserve, develop the picture of acute right heart

failure. In these cases, the arterial blood pressure is maintained and the cardiac output is but little reduced, instead the right ventricle and right auricle distend tremendously and the picture of acute congestive heart failure with liver enlargement and tremendous elevation of venous pressure, occurs. In this type of cardiac response it is the distention of the heart and the elevation of the venous pressure on the right side which automatically introduce the compensatory mechanism enabling the right ventricle to meet this sudden obstruction of the pulmonary circulation and the accompanying acute pulmonary hypertension. The heart by distention is enabled to do the excessive work necessary and still maintain its normal output, which permits survival of the patient. The heart is a pump, the work of which is automatically increased by distension and this is the most important law governing its activity. Of course, in some instances when the distension becomes so excessive that the heart exceeds the limits of increasing work, the law no longer operates, and the patient may succumb from the acute right heart failure which ensues.

It is thus apparent that the dynamic effects of pulmonary embolism depend upon its magnitude, upon the speed of its accretions, upon the amount of chronic pulmonary congestion and upon the power and reserve of the heart. The results of pulmonary embolism therefore may vary from instances with no demonstrable symptomatology, to a classical picture of shock, to a picture of acute right heart distension, and even to acute right heart failure. Death may follow shock or acute right heart failure, or may occur unexpectedly due to reflex ventricular fibrillation.

CONCLUSION

In conclusion it has been the purpose of this presentation to approach the problem of pulmonary embolism from the point of view of the clinical physiologist. It is hoped that thus the reader may have been introduced to the physiologic reasoning used to account for some of its clinical manifestations and that he has come to appreciate why the condition of pulmonary embolism may vary so widely, depending on the circumstances analyzed in this discussion.

CONCLUSION

El propósito de este informe ha sido el de abordar el problema de la embolia pulmonar desde el punto de vista del fisiólogo clínico. Se abriga la esperanza de que en esta forma se haya traído al lector al razonamiento fisiológico empleado para explicar algunas de sus manifestaciones clínicas, y de que el haya llegado a apreciar por qué es que la embolia pulmonar puede variar tan extensiva-

mente, de acuerdo con las circunstancias analizadas en esta discusión.

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Discussion

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The incidence of pulmonary embolism is quite high. By far the majority of such lesions occur with no or very slight clinical signs and symptoms. On the other hand, it has probably been the experience of most observers that numerous cases of what might appear to be pneumonia or pleurisy have later proven to be due to infarction of the lungs. The source of such emboli may be very difficult to find and this serves to obscure the real nature of the changes which are going on in the chest.

There are just a few comments which I should like to make on some of the points raised by the author of the paper which has just been presented.

Dr. Katz has stated that preexisting heart disease in the form of chronic pulmonary congestion must be present in order for pulmonary infarction to occur. While it is true that pulmonary infarction is more common in patients with chronic heart disease, it has been our experience that infarction of the lungs not infrequently occurs in the absence of this complication.

The author has pointed out that it is only when a considerable amount (over 60 per cent) of the pulmonary arterial tree is suddenly occluded that the cardiodynamic effect of pulmonary emboli becomes apparent. This is usually in the form of acute cor pulmonale. There is no question that the mechanism of this disturbance is due in large part to the purely mechanical effects. The tremendous and sudden increase of resistance in the pulmonary arterial system may produce the picture of shock which is associated with a decrease in arterial pressure, hence a reduction in coronary blood flow. The imbalance thus produced between increase in work of the heart and diminution of its blood supply may not only result in a "relatively inadequate coronary blood flow for the needs of the right heart," but also not infrequently produces myocardial necrosis or infarction of the left ventricle. This is most likely to occur if the heart is previously hypertrophied, if the coronary arteries are already narrowed by arteriosclerosis and if there is an adequate duration of life after the embolism.

It has yet to be proven in man however, that the associated asphyxia and exaggerated vagal reflexes do not play a role in this syndrome. While Dr. Katz' work suggests that such reflexes do not exist, the experiments, among others, of N. C. Gilbert and of Hall and Banting would seem to indicate that stimulation of the vagus nerve does produce spasm of the coronary arteries. In the face of these conflicting facts, further studies are necessary before the importance of the vagal reflex in the control of coronary blood flow can be definitively appraised.

I have just one more comment to make. Regardless of whether the pulmonary emboli occur in showers or if a large vessel is occluded, we have found that the early administration of oxygen is an important and beneficial therapeutic agent.

Dr. Katz is to be commended on his novel and ingenious experiments. By distention of the root of the superior vena cava, he has demonstrated a new factor in the mechanism of the dyspnea in pulmonary embolism. His paper has served a very useful purpose in stimulating interest in this important syndrome.

Tuberculosis and Pregnancy

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The condition of pulmonary tuberculosis associated with pregnancy constituted, in the past, one of the most serious problems encountered by the pthysiologist. Today, because of the newer concepts in the treatment of pulmonary tuberculosis, the condition has lost its grave and sinister aspect and the ultimate prognosis can now be regarded as favorable.

In France, it was Etienne Bernard a member of the League of Nations, who in 1938, stated in his excellent book, "Tuberculose et Medecine Social," the alarming words, "Je suis au coeur du drame." This statement was made in direct reference to the alarming high mortality from pulmonary tuberculosis occurring in the women of his country between the ages of fifteen and forty. He further called attention to the medical profession that if this condition was not corrected, the birth rate of France would be seriously threatened.

Because of the existing chaotic conditions the world over and the expected increase in the incidence of pulmonary tuberculosis, it becomes increasingly evident that the problem of tuberculosis associated with pregnancy will come to demand greater attention by those engaged in the fields of pthysiology, epidemiology and sociology. The period of planning and rehabilitation which necessarily must follow the present gigantic world struggle will in a large measure be further hastened by the combined co-operation of the above agencies in the prevention and control of tuberculosis.

Without dealing with the moral and religious side of this important problem, I wish only to analyze its clinical and social aspect. The favorable prognosis of the expectant mother of today suffering from pulmonary tuberculosis has been largely due to the following factors:

1. Greater utilization of various forms of collapse therapy;
2. Progress made in the field of obstetrics;
3. Newer knowledge in the field of endocrinology.

The rapid progress made in the field of endocrinology has served to explain the causative factors concerned in the etiology of amenorrhea and dysmenorrhea, conditions commonly observed in women suffering from pulmonary tuberculosis. Further, it has been brought to light that the increased metabolic activity during pregnancy, resulting in a greater increase in follicular hormone

and cholesterol, may retard or suspend the progress of tuberculosis. This is further borne out by clinical observations that, generally, it is only following parturition that one sees the greatest reactivation of the pulmonary disease.

From these considerations it becomes evident that tuberculous women of today may be assured the right of motherhood without further danger to the reactivation of their pulmonary disease. Each case however, must have a thorough individual study and if necessary extreme aggressive measures be instituted to control the disease during the period of gestation.

SUMMARY

We may therefore, draw the following conclusions from the present knowledge of pulmonary tuberculosis complicated by pregnancy:

1. Collapse therapy has definitely minimized the reactivation of pulmonary tuberculosis.

2. In well controlled tuberculosis it is safe to assure the mother to undertake the added responsibility of pregnancy.

Under my direction, extensive experimental and clinical research carried out by the members of the staff of the Polyclinic Hospital of Rio de Janeiro has brought to light the following observations:

1. Pregnancy in confirmed tuberculosis has lost the sinister gravity it held for ancient obstetricians.

2. Greater use of the methods of collapse therapy has destroyed the fear of pulmonary reactivation which was formerly held in the management of tuberculosis complicated by pregnancy.

3. Therapeutic abortion is a dangerous and unwise procedure in patients with active disease.

In regard to the expectant mother with advanced tuberculosis which is not amenable to any form of therapy, the main purpose must be to try to safeguard the life of the mother until such time as the fetus becomes viable, so that this new life may substitute for the one which succumbs to disease.

It is evident therefore, that these therapeutic principles form the basis of a powerful factor of social defense and constitutes one of the conquests of modern physiology.

RESUMEN

A base de lo que se sabe hasta el presente de la tuberculosis pulmonar complicada por la preñez, podemos sacar las conclusiones siguientes:

1. La colapsoterapia ha reducido al mínimo la reactivación de la tuberculosis pulmonar.

2. En tuberculosis bien dominada no es peligroso asegurar a la

madre que puede asumir la responsabilidad adicional de la preñez.

Extensas investigaciones experimentales y clínicas llevadas a cabo, bajo mi dirección, por los miembros del cuerpo médico del Hospital Policlínico de Río de Janeiro, han revelado las observaciones siguientes:

1. La preñez en tuberculosis comprobada ha perdido ya la idea de gravedad siniestra en que la tenían los antiguos especialistas en obstetricia.

2. El empleo más extenso de la colapsoterapia ha acabado con el temor de reactivación pulmonar que se tenía antes en el tratamiento de tuberculosis complicada por preñez.

3. El aborto terapéutico en pacientes con enfermedad activa es un procedimiento peligroso e imprudente.

En cuanto a la mujer preñada que tiene tuberculosis avanzada no tratable por ninguna terapia, el objeto principal debe ser el de procurar proteger la vida de la madre hasta que el feto sea viable, a fin de que esta nueva vida pueda reemplazar a la que va a sucumbir a la enfermedad.

Es evidente, pues, que estos principios terapéuticos forman la base de un poderoso factor de defensa social y constituyen una de las conquistas de la fisiología moderna.

The Tuberculosis Problem and the Organization of the Tuberculosis Campaign in Venezuela*

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Venezuela, the most northerly country of South America, has an area of 560,000 square miles and a population of about 4,000,000. With the greater part of the country almost uninhabited, the population is concentrated along the Caribbean Coast on the north and the range of the Andes Mountains in the west. This peculiarity explains many of the features of its epidemiology, especially with regard to tuberculosis. The average general density of its population is about seven inhabitants per square mile.

Our knowledge of the problem of tuberculosis in Venezuela is based on the surveys made by the institutes for the fight against the disease which, since 1936, cover a total of 250,000 observations among the different groups comprising our population. The survey has been made by means of the tuberculin test and the chest x-ray examination.

Tuberculosis in Venezuela can be summarized as follows:

Mortality—In urban centers the tuberculosis mortality reaches an average of 250 per 100,000 inhabitants, the rates fluctuating from 210 to 470 according to localities.

Among the causes of mortality in Venezuela, tuberculosis occupies a leading position, reaching in certain cities from 12 to 23 per cent of the general mortality.

In cities like the capital, Caracas, it has been proved that the tuberculosis mortality of different ages is similar to that of other centers of old and massive tubercularization. In this city and other populated centers the rate has shown a decline in the last few years.

According to historical data, we learn that during the eighteenth century the cases of tuberculosis in Caracas and the principal cities were such as to merit the attention of the authorities. In 1795, Don Juan Guillelmi, the Spanish governor of the Province, decreed a "Bando de Buen Gobierno" in which he ordered that he be notified of any death caused by tuberculosis.

The social peculiarities in that distant Spanish colony, added to the lack of means of communication and its scattered population,

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were the causes which prevented the epidemic wave from becoming acute. Besides, it is well to point out here that living conditions in the capital at that time were not so bad as the revolutionaries pretended, since Humboldt in 1800 affirms the following: "The consumption of commissary, especially meat, in the cities of Spanish America is so enormous that in the year 1800 in Caracas alone 40,000 heads of cattle were killed; while in Paris, with a population fourteen times as great, no more than 70,000 heads of cattle were consumed during the time of Monsieur Necker."

In the nineteenth century there was an increase in tuberculosis due to the conditions created by the War of Independence. Insofar as Caracas was concerned, the exodus of patriots under the tyrannic rule of Governor Monteverde, as well as the casualties of the earthquake of 1812, which numbered 12,000, rapidly brought down the population of the capital from 50,000 to 20,000 inhabitants.

An important scientific study published in 1832 by Dr. Jimenez, a pupil of Dr. Vargas, the later being the founder of medical studies in Venezuela in the year 1827 under the government of the Liberator Simon Bolivar, describes as of an acute epidemic character the many cases of pulmonary and especially *external* forms of tuberculosis. The frequency of the ganglionic forms to which he makes reference is taken by us as related to the similar recent observations by Drs. Cummins and Fergusson on cases of this type occurring in Indians of North America and the plains of Canada on the occasion of an acute epidemic wave of tuberculosis.

It seems remarkable that in this part of the Continent, at that time, we should be able to find such a well-prepared study as the one I have just mentioned. Nevertheless, it should not surprise us as there were to be found brilliant names among the medical profession of the time, as for example that of Dr. Alexandre Prospere Reverend, the physician who attended the Liberator Simon Bolivar on his death-bed in Santa Marta, Colombia, in 1830, and who practiced the autopsy upon him, this being a model of scientific description of a case of pulmonary tuberculosis.

During the remainder of the nineteenth century the epidemic wave continued rising in Caracas until the beginning of the twentieth century, in which we find from six to seven hundred deaths per 100,000 inhabitants. This is not surprising, however, if we recollect that in the 70 years intervening between 1830 and 1900, 55 were years of war with only 15 peaceful years.

From 1900 and before the beginning of the fight against tuberculosis, which is very recent, there is a spontaneous descent in Caracas of the mortality by tuberculosis from the high figures already mentioned to 241 per 100,000 which is that of 1943.

Morbidity—The systematic examination of groups has facilitated

the finding of an important proportion of active pulmonary lesions, as follows:

Urban centers	2.43%
Semi-rural	1.52%
Rural	1.02%
Indian	0.98%

Infection—The tuberculin test reveals in urban centers the prevalence of massive infection, the smallest index found among children from 0 to 4 years of age being 20 per cent positive. In children up to 14 years of age the rate of infection in all cities rises up to 51 per cent. In persons older than 14 years, this rate is 83 per cent.

Away from the cities, the infection indexes decline sharply when the centers are considered as a whole, according to the following figures:

Semi-rural centers	25.9%
Rural	27.3%
Indian	25.9%

The analysis of data at hand reveals two contrasting infection patterns: in urban areas the infection is massive and early, followed by a regular ascending course; in other centers, the infant and youth infection is more moderate, arriving at still higher rates of infection later in life.

THE CAMPAIGN AGAINST TUBERCULOSIS

The anti-tuberculosis campaign started in Venezuela in 1936, when the Tuberculosis Division was created within the Ministry of Public Health and Social Welfare.

The main characteristic of the Venezuelan organization of the campaign against tuberculosis is the *centralization* of its technical direction in the Tuberculosis Division. This Division not only controls the activities of all the government dispensaries and sanatoria, but is also responsible for defining the standards to be followed by private agencies, such as tuberculosis associations.

We have the Tuberculosis Division which is responsible for the preparation of personnel, study of the work programs and control of the activities of the services. Preparation of personnel is at present being carried on in the Sanatorium "Simon Bolivar" in Caracas which has been thoroughly organized as the National Tuberculosis Institute.

The Dispensaries, totalling 21, cover most of the important cities. These Dispensaries carry on epidemiological studies in their respective areas and the sanitary work in tuberculosis, including ambulatory collapse therapy; they are the only agencies that can send

patients to tuberculosis hospitals, even though they are not controlled by the Ministry of Public Health and Social Welfare. They also superintend the work of the tuberculosis associations in their respective localities.

Because of the present sanitary regulations requiring all workers to present a health certificate, the case-finding activities have greatly increased.

The structure of our tuberculosis organization, however, has its weak point which is a sad lack of auxiliary nursing personnel, as our National School of Nursing was only opened in 1939. Nevertheless, in some localities there is marked progress. For example, in Caracas during the past year four contacts per patient were examined, 7 per cent of which were found with active lesions. It was impossible to realize a correct follow-up of the healthy contacts, except in 10.41 per cent of the cases. Insofar as pregnant women in Caracas were concerned, almost 50 per cent of the women who gave birth were examined.

As 66 per cent of the Venezuelan population is dispersed in many small urban centers and rural zones, and as Dispensaries have already been established in the principal cities, it became necessary to study the system anew in order to continue extending the control of tuberculosis throughout the country. We tried out a system of travelling clinics using a trailer carrying x-rays and electric plant. This was a failure. Two years ago we began to extend, with marked success, a course of study in sanitary phthisiology to the public health doctors who would later have charge of Health Units in small towns to prepare them for case-finding work. This course comprises 152 hours of practical work in x-ray chest examination and 21 lectures on tuberculosis.

These Health Units with special tuberculosis service constitute what is known to us as *secondary network of tuberculosis clinics*, and have already been established in seven towns. It is evident that these services widen the radius of action of the Dispensaries, which in turn control the work executed by them, especially insofar as supervision of the chest films is concerned.

Tuberculosis Beds—The federal program now being developed provides a sanatorium in Caracas ("Simon Bolivar," 300 beds) already in service; one being built in Merida, Western Venezuela (150 beds); and another soon to be started in the East (Cumana, 300 beds).

Other agencies have constructed or are constructing tuberculosis hospitals, such as that in San Cristobal (100 beds), that in Maracaibo (300 beds) and that in Caracas (500 beds). At the present time the country has 1200 beds available for tuberculosis patients.

Tuberculosis Associations—Until two years ago all the activities

of the Venezuelan tuberculosis control were administered by the Federal Government. From that time on tuberculosis associations have been organized and now exist in nine states of the republic. In order to cooperate with the government program, these associations bring together the local Public Health authorities, Welfare Boards, private institutions and general public.

The salient point is that all these associations have an *Advisory Committee* directing their activities, a member of which is the phthisiologist of the Tuberculosis Division of the locality.

All the tuberculosis associations are specially engaged in seeking a solution to the problem of beds and to the development of an educational program in their midst.

On December 11, 1943, the federation of these associations was made, thus uniting them in principles and standards.

In 1937 we founded the Venezuelan Phthisiological Society (*Sociedad de Tisiologia de Venezuela*) which has already met three times in national conventions and acts as advisory board of the Tuberculosis Division.

SUMMARY

The concentration of Venezuela's population, numbering about four millions, along the Caribbean coast and the Andes Mountain range, exerts a notable influence on its epidemiology, especially with regard to tuberculosis.

Our knowledge of the problem of tuberculosis in this country is based on surveys made by means of the tuberculin test and chest x-ray among the different groups comprising our population.

Tuberculosis occupies a leading place among causes of death. In urban centers the rate varies from 210 to 470 per 100,000 inhabitants, according to localities. It has shown a decline in the last few years.

Historical data are presented with regard to the prevalence and nature of the disease in Venezuela since the eighteenth century.

Tuberculosis morbidity and infection have been found greatest in urban areas, decreasing in other areas. In urban areas the infection is massive and early, followed by a regular ascending course; elsewhere the infant and youth infection is moderate.

The anti-tuberculosis campaign began in 1936 when the Tuberculosis Division was created within the Ministry of Public Health and Social Welfare. The technical direction of the campaign is centralized in the Tuberculosis Division, which controls the activities of all the government Dispensaries and Sanatoria, and which is responsible for defining the standards to be followed by the tuberculosis associations and for preparation of personnel.

The Dispensaries, totalling 21, cover the work of most of the important cities. They carry on epidemiologic studies and the sani-

tary work in tuberculosis, including ambulatory collapse therapy, refer patients to tuberculosis hospitals and superintend the work of the tuberculosis associations. The weak point of our tuberculosis organization is lack of nursing personnel.

In order to reach the 66 per cent of our population in semi-rural and rural zones, Health Units are being established in small towns, and are in charge of Public Health doctors trained in tuberculosis case-finding.

At the present time we have 1,200 beds available for tuberculosis patients, and facilities providing 450 additional beds are being built or are soon to be built.

Until two years ago all the activities of Venezuelan control were administered by the Federal Government. Since that time tuberculosis associations have been organized in nine states of the republic. They are especially engaged in seeking a solution to the problem of beds and in the development of educational programs. Each of these associations has an Advisory Committee directing its activities, a member of which is the phthisiologist of the Tuberculosis Division of the locality. These associations united into a federation in December, 1943.

The Venezuelan Phthisiological Society was founded in 1937. It acts as Advisory Board of the Tuberculosis Division.

RESUMEN

La concentración de la población de Venezuela, de cerca de cuatro millones, a lo largo del litoral del Caribe y de la Cordillera de los Andes, ejerce una influencia notable sobre la epidemiología, especialmente con relación a la tuberculosis.

Lo que sabemos acerca del problema de la tuberculosis en este país está basado en censos llevados a cabo entre los diferentes grupos que componen la población, usando la prueba de la tuberculina y radiografías torácicas.

La tuberculosis ocupa una posición capital entre los causas de muerte. En los centros urbanos la mortalidad varía del 210 al 470 por 100,000 habitantes, de acuerdo con la localidad; pero ha manifestado un descenso en los últimos años.

Se presentan datos históricos acerca de la prevalencia y naturaleza de la enfermedad en Venezuela desde el Siglo XVIII.

Se ha encontrado que la morbilidad e infección tuberculosas son mayores en las zonas urbanas, y disminuyen en otras regiones. En las zonas urbanas la infección es masiva y temprana, y sigue un curso ascendente uniforme; en otras partes la infección infantil y juvenil es moderada.

La lucha anti-tuberculosa comenzó en 1936 cuando se estableció la Division de Tuberculosis en el Ministerio de Sanidad y Asistencia

Social. La dirección técnica de esta lucha está centralizada en la División de Tuberculosis, que dirige las actividades de todos los Dispensarios y Sanatorios del Gobierno, y tiene la responsabilidad de definir las normas a que deben obedecer las Asociaciones Antituberculosas y que deben observarse en la preparación del personal.

Los Dispensarios, en número de 21, hacen la labor en la mayor parte de las ciudades más importantes. Estos llevan a cabo estudios epidemiológicos y la labor sanitaria en la tuberculosis, inclusive de la colapsoterapia ambulante; envían pacientes a los Hospitales para Tuberculosis y ejercen superintendencia sobre la labor de las Asociaciones Antituberculosas. El punto flaco de nuestra organización antituberculosa es la falta de personal de enfermeras.

A fin de alcanzar al 66 por ciento de nuestra población en las regiones rurales y semi-rurales, se está estableciendo en los pueblos pequeños Oficinas de Sanidad a cargo de médicos sanitarios entrenados en el descubrimiento de casos de tuberculosis.

Tenemos al presente 1,200 camas disponibles para pacientes tuberculosos, cifra ésta que en un futuro muy próximo se elevará con el establecimiento de 450 camas más.

El Gobierno Federal, hasta hace dos años, administraba todas las actividades en el control de la tuberculosis en Venezuela. Desde entonces se han organizado Asociaciones Tuberculosas en nueve de los Estados de la República, las que se ocupan principalmente de buscar una solución al problema de las camas y del desarrollo de programas educacionales. Cada una de estas Asociaciones cuenta con una Junta Consultiva que dirige sus actividades, uno de cuyos miembros es el tisiólogo de la División de Tuberculosis de la localidad. Estas Asociaciones se reunieron en una Federación en Diciembre de 1943.

La Sociedad Venezolana de Tisiología, fundada en 1937, actúa como Junta Consultiva del Departamento de Tuberculosis.

SYMPOSIUM

Tuberculosis in World War II*

Council on Military Affairs and Public Health**

American College of Chest Physicians

Fellows of the College, distinguished guests, ladies and gentlemen:

Your Council on Military Affairs and Public Health today completes its fourth year of active work.

Three years ago at the annual meeting of the College at Cleveland, Ohio, your council sponsored its first luncheon program. At that time a full report of all surveys conducted by the council was made. At the same time, a plan for the rapid and efficient examination of chests of each individual entering the armed forces was discussed and adopted. These reports in full were then turned over to those in authority in the medical departments of the armed forces, the public health and the United States Veterans Bureau.

The second luncheon program sponsored by this council was held during the annual meeting at Atlantic City. At that luncheon, the representatives of the Surgeon General of the Army, Navy, Public Health, the United States Veterans Bureau and the National Research Council reported to us how the respective agencies expected to meet the tuberculosis problem confronting them and discussed the various regulations and policies that were being formulated to keep tuberculosis at a minimum in our armed forces and at the same time to meet the public health problems arising as a result of mass x-ray examinations of selectees and industrial war workers.

Today's program will consist of reports based on the experiences of all our medical government agencies as well as a report by the chief consultant in the tuberculosis section of the Surgeon General's office of the Canadian Army. The facts developed and reported here this afternoon will be very interesting and highly instructive.

Chas. M. Hendricks, M.D., F.C.C.P.
El Paso, Texas, *Chairman.*

*Presented at the Tenth Annual Meeting, American College of Chest Physicians, Chicago, Illinois, June 11, 1944.

**Richard Davison, M.D., F.C.C.P., Chicago, Illinois; Captain Robert E. Duncan, U.S.N., F.C.C.P., Bethesda, Maryland; Herman E. Hilleboe, M.D., F.C.C.P., Washington, D. C.; Maj. Gen. Shelley U. Marietta, U.S.A., F.C.C.P., Washington, D. C.; Joseph W. Post, M.D., F.C.C.P., Philadelphia, Pennsylvania; Samuel E. Thompson, M.D., F.C.C.P., Kerrville, Texas; Walter E. Vest, M.D., F.C.C.P., Huntington, West Virginia, and Col. Roy A. Wolford, M.C., F.C.C.P., Washington, D. C.

Tuberculosis in World War II

The Army Viewpoint

MAJ. GEN. SHELLEY U. MARIETTA, F.C.C.P.*
Washington, D. C.

World War I was a guidepost for us in many respects so far as medical matters are concerned.

The lessons we learned then have been applied more or less successfully and in some instances hesitantly and with procrastination, to our problems of World War II. Occasionally this seeming procrastination was really the delay incident to obtaining equipment or to securing legislation necessary to implement our efforts.

Tuberculosis was a major problem both during and after World War I. In this respect the experience of our country was not unique. At that time, because of the scarcity of x-ray equipment, reliance had to be placed on physical examinations. Numerous teams of chest experts, working under many difficulties, eliminated a considerable number of cases of pulmonary tuberculosis, still thousands were accepted for military service. As a result there were in 1922, 44,591 veterans under hospital care by the Veterans Bureau for this disease. In 1940, prior to the current mobilization, the number had declined to something less than 10,000. The total cost of this experience has been approximately one billion dollars.

The problem in this war has been two-fold: 1. To eliminate as far as possible the acceptance for military service of (a) individuals with active tuberculosis or (b) those with inactive lesions of such an extent as to suggest the possibility of re-activation under the stress of active duty; and 2. To prevent the rejection for the military service of (a) those with minimal tuberculous lesions not constituting an undue hazard for the inductee and (b) those with conditions which might suggest to the examiner a tuberculosis process.

Fortunately everyone agreed that the most rapid and accurate method of deciding as to these factors was by means of properly taken and properly interpreted x-ray films of the chest.

Such a procedure was of value also in bringing to attention various other conditions of the lungs, heart, large arteries, diaphragm, mediastinum and bony frame work of the chest.

Quite naturally, discussion immediately arose as to the most accurate and rapid method of making films of the chest and the standards to be adopted regarding the limit of acceptable pulmonary tuberculosis. There was some delay in arriving at a decision in these matters and later in acquiring the necessary x-ray equipment but the final results are well known and require no comment.

In October 1940, following the declaration of a national emergency in August, a War Department directive required that chest x-ray examinations be made on all registrants in whom pulmonary disease was suspected and made the procedure routine wherever facilities were available. By March 1, 1941, 51 per cent of all inductees had had chest

*Commanding Officer, Walter Reed General Hospital, Washington, D. C.

films. By March 1942, x-ray examinations of the chest were being done on all applicants.

In the meantime, after several revisions, arbitrary standards based on x-ray film interpretation, were set up for the guidance of the various boards of examiners and Mobilization Regulations 1-9, March 15, 1942, based such determination on the size and number of calcifications present, excluding of course any x-ray evidence of parenchymal involvement other than scarred lesions of less than 5 square centimeters in extent and providing that stability of the lesion had been established by six months' observation.

The practical result has been a general rejection rate of from 1.5 per cent to 1 per cent of all men examined. This represents applicants studied by the Army Induction Stations and screened out by the local boards.

Based upon a possible 8 million men examined, this would indicate the rejection of approximately 120,000 tuberculous cases.

Despite the precautions, a considerable number of tuberculous individuals have been inducted because of poor film interpretation by inexperienced roentgenologists, or other causes of error. This has been evidenced by the work of Long and Stearns who reviewed 53,400 films of inductees made in the months of April to September 1942.

Most of the cases so missed and placed on active duty are discovered through army procedure within 6 months (80%—Long). Further, the filming of the chest of men about to be discharged from the military service for any cause as required by the War Department, will bring other cases to light and lead to their reference to the proper agencies for observation and treatment.

The average admission rate for tuberculosis in World War I was 11.8 per thousand. It is now 1.0, less than one-tenth of the former rate. This difference is attributable to the better methods now in use to discover cases.

In World War I, tuberculosis was the leading cause of discharge for disability, amounting to 15 per cent of all such discharges. In 1943 tuberculosis was tenth in the list of causes for discharge for disability, amounting to 1.6 per cent of all such discharges.

The admissions per thousand for tuberculosis in the army in the continental United States averaged: 1.8 for 1941, 1.73 for 1942, and 1.2 for 1943.

Evidently our record, in spite of the many difficulties and delays experienced, is not too bad.

Tuberculosis in World War II From the Navy Standpoint*

CAPTAIN ROBERT E. DUNCAN (M.C.) U.S.N., F.C.C.P.**

Bethesda, Maryland

In so far as it can be determined at the present time, there has not been an appreciable increase in the incidence of tuberculosis in the Navy during World War II. As a matter of fact, morbidity reports for the calendar year 1943 indicate a slight decrease. At the meeting of the Southern Chapter of the American College of Chest Physicians in Cincinnati last November, Lieutenant Commander Dean F. Smiley (MC), USNR from the Preventive Medicine Section of the Bureau of Medicine and Surgery of the Navy Department, presented a most interesting statistical study of tuberculosis in the Navy from 1900 to 1942, inclusive. This article has just been published in the May-June issue of our journal *Diseases of the Chest*. It shows that there has been a gradual reduction in the rate for original admissions to the sick list for tuberculosis until, in 1942, the rate was only one tenth that of 1900. There have been several interruptions in this downward curve. An important "hump" occurred between the years of 1918 and 1922. The increase occurring during this period was considered to be due to World War I when there was a drastic reduction in physical examination standards for entrance into the Navy, and also a pandemic of influenza. This latter not only directly conduced to tuberculosis but also led to an unprecedented use of chest radiography, which in turn uncovered many new cases of this disease. Since 1922 the original admission rate in the Navy continued steadily downward until 1941 and 1942 when a sharp rise was again evident. An analysis of statistics for this period, however, showed that there was no reason to view this increase with alarm as it was directly attributable to arrested chronic pulmonary tuberculosis and was apparent rather than real since it represented improved case finding rather than more tuberculosis. It was during this period that the Navy inaugurated its program of mass photofluorographic chest examination of recruits. As these persons were already in the service when x-rayed, they had to be hospitalized for the purpose of discharge from the service and, as a result, the admission rates and invalidings from the service underwent a precipitous increase. A breakdown of these cases into those existing prior to service and those occurring in line of duty clearly shows that the downward trend of this curve was not actually interrupted.

Since February 1943, practically all applicants to the Navy have been receiving radiographic chest examinations at the Selective Service In-

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The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval service at large.

Due to the organization of the Medical Corps of the U. S. Navy, the term "Navy" also includes the U. S. Marine Corps.

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duction Centers throughout the country. Statistics for the calendar year 1943, which have become available since Dr. Smiley's report of last November, indicate that this system of chest radiography prior to induction into the service is exerting an extremely favorable influence upon the tuberculosis incidence in the Navy. The descent of the admission rate curve since 1942 has been just as precipitous as was the rise during the period of 1941 and 1942. It is difficult to present statistics without slides and charts. However, this change can probably be depicted by quoting the admission rates for the past four years. They were as follows:

in 1940.....	106 per 100,000
in 1941.....	203 per 100,000
in 1942.....	310 per 100,000

and in 1943 (following preinduction chest radiography) the rate had dropped to only 66 per 100,000. The rates for 1943 were figured on the basis of an average strength of 2,009,334. In view of the continued expansion of the practice of preinduction chest radiography, I feel confident that the comparable rate for 1944 will fall still lower.

In February 1943, when Navy recruiting was discontinued and we began obtaining personnel through selective service, mass chest photofluorography of all recruits was no longer necessary and this program was discontinued. This does not mean, however, that the Navy has abandoned its tuberculosis control program. Since that date our photofluorographic units have been used throughout the service to conduct chest examinations of the crews of ships returning for overhaul; samplings have been taken of large groups of recruits in our training stations; Waves, all of whom voluntarily enlist, nurses, and officers are all given this examination shortly after entrance into the service. So you see, these units have not been idle. Our mobile bus units have been conducting chest surveys of all V-12 personnel in colleges throughout the country. This program having now been completed, our bus units are making x-ray chest examinations of personnel in outlying stations who have not had such an examination in the past 12 months. For example, the East Coast Mobile Bus Unit is at present conducting such a survey in the Potomac River Naval Command area, which comprises Metropolitan Washington and all outlying stations in Virginia and Maryland. So far in this survey, 6,249 photofluorograms have been made. In this group, fifteen persons were disqualified by reason of pulmonary tuberculosis and were hospitalized for further study and disposition. The incidence of tuberculosis in this group was 0.22 per cent. It is interesting to note, that of these fifteen cases six had a record of previous x-rays which were reported as negative and nine had no report of a previous x-ray of the chest. This small study certainly demonstrates the need of periodic chest radiographic studies of Naval Personnel.

We are about to launch upon such a program. A complete photofluorographic unit, a radiologist and technicians are at present en route to Pearl Harbor, Hawaii. This unit will be set up in the Navy Yard of that Port and will be available for surveys of all personnel attached to Naval vessels returning to Pearl Harbor from the combat zone. Likewise, Naval personnel of the Navy Yard and of other activities in the Hawaiian area who have not had a radiogram of the chest in the past 12 months will be given this examination. This procedure should

be in effect by the first of July 1944. In view of the crowded living conditions aboard Naval vessels in time of war and the severity of duty in the War zone, I believe that this particular case finding program will prove to be of utmost importance. A widespread tuberculosis control program is at present under consideration by the Bureau of Medicine and Surgery. It is contemplated that this program will provide for the following measures:

1. A continuation of our present requirement of a roentgenogram of the chest as a part of the physical examination to determine physical fitness for original entry into the service or for active duty of all candidates other than those who have entered the service through induction centers.

2. A roentgenographic examination of the chest of all Naval and Marine Corps personnel on active duty who have not been so examined during the last twelve months. This examination will be made at the earliest opportunity. Thereafter, roentgenographic examinations of the chest of personnel on active duty under the ages of 30, will, if practicable, be made at least once a year.

3. A roentgenographic examination of the chest of all Naval and Marine Corps Personnel will be made during the physical examination at the time of release from active duty or discharge from the service unless such an examination has been made during the previous six months.

4. All Naval and Marine Corps activities with the necessary x-ray equipment will be considered as available for these examinations. Whenever practicable these examinations will be made by the photofluorographic technique for the obvious convenience of mass examinations and for conservation of film. Stationary photofluorographic units will be located in our Navy Yards for the examination of the personnel of Naval vessels and personnel of the Yard and also at other shore stations within that Naval District where the numbers of such examinations is sufficiently great. Mobile photofluorographic units will be made available to outlying stations within each Naval District.

5. Individuals in whom the photofluorographic film discloses abnormal conditions will be re-examined by a standard 14" x 17" film prior to final action in their case.

I have been assured that the program that I have just outlined will be in operation in the near future.

Our country is fighting a global war. Our Naval forces are scattered over the seven seas. Our medical personnel are busily engaged in caring for war casualties, installing sanitary measures in most insanitary areas, in combating severe tropical and exotic diseases and, according to all reports, they are doing a splendid job. Under these circumstances, the complete fulfillment of our tuberculosis control program may not be humanly possible. I do not expect it to be 100 per cent effective. But I am certain that your Navy will continue to make a real fight against our ancient foe—Tuberculosis, and that our record in this war will be far superior to that of World War I.

Tuberculosis in World War II, In the Canadian Army

COL. J. D. ADAMSON, R.C.A.M.C.*
Winnipeg, Canada

Over one and a half million prospective members of the forces have been x-rayed and examined for tuberculosis in Canada. This represents 26 per cent of the male population and 63 per cent of males of army age. Of those examined, one per cent are found to have pulmonary tuberculosis that was considered to be significant from the service point of view. One-third of these had disease that was considered active or unstable. This represented 5,000 individuals and these were referred to the civilian tuberculosis authorities for treatment.

This screening resulted in an army comparatively free from tuberculosis. In the overseas army, practically no cases were discovered till the summer of 1941. Since that time cases have been returning at a fairly steady rate with a slight tendency to increase from year to year. The present incidence of new cases overseas is estimated at about 15 or 20 per cent of the prevailing civil rates of the same age and sex groups.

In contrast to this the incidence of pleurisy with effusion among overseas troops has been abnormally high. Cases began to appear suddenly in the summer of 1942 and reached an incidence of 50 per 100,000 which is considered to be about five times as great as the expectancy in civil life. Since then the rate has remained about the same.

This relatively high incidence of pleurisy with effusion is considered to be the result of impingement of a relatively tuberculous environment on an army in which the rate of tuberculin negativity is high.

In contrast to the overseas army, the army in Canada has consistently run a low rate of pulmonary disease which is estimated to be about 10 per cent of the civil expectancy. Pleurisy with effusion keeps at a steady rate which is slightly less than civil rates.

Non-pulmonary forms of tuberculosis in both armies has remained consistently between 7 and 10 per 100,000 with no tendency to become less or more. This steady low rate is attributed to the fact that extra-pulmonary disease is, to a large extent, a legacy of old infections and its incidence is not immediately influenced by contact with tuberculosis.

All cases of tuberculosis in the Canadian Army are immediately turned over to Provincial tuberculosis organizations for treatment at the expense of the Department of Pensions and National Health.

*Consultant in Medicine, Department of National Defense, Canada.

Tuberculous Veterans of World War II: An Analysis*

COLONEL ROY A. WOLFORD, M.C., F.C.C.P.**
Washington, D. C.

An analysis of the case histories of 845 World War II beneficiaries entering one of our tuberculosis hospitals from December 7, 1941 to February 29, 1944, showed 823 were admitted for tuberculosis, of which 209, or 25 per cent, had been diagnosed as tuberculous by the armed forces after service outside the continental limits of the United States.

Of the total of 823 admitted for tuberculosis, 27, or over 3 per cent, were found to have no pulmonary disease; 15, or almost 2 per cent, had extra pulmonary tuberculosis only, and 46, or about 6 per cent, were considered to have inactive or arrested pulmonary tuberculosis. Of the active pulmonary cases, the extent of involvement in 24 per cent was minimal; in 31 per cent, moderately advanced, and in 45 per cent, far advanced. Approximately 30 per cent had received some form of surgical collapse while in the service hospitals. After admission to the Veterans Administration facility, surgical collapse was continued in 25 per cent of the cases and subsequently induced in an additional 25 per cent, so that while under treatment in the Veterans Administration hospital 50 per cent of the 823 World War II patients received some type of surgical collapse. The procedures employed consisted of induced pneumothorax; pneumoperitoneum; phrenic crush; intrapleural pneumolysis; thoracoplasty in various stages; revision operations and an Eloesser resection. In the majority of instances but the one type of collapse was performed, but in many cases several types in combination were utilized, while in eight patients bilateral collapse was induced.

In all hospitals through March 1944, admissions of tuberculous veterans having service after December 7, 1941 approximated 7,200. About 4,200 of these had been discharged during this twenty-eight months' period so that almost 42 per cent of the World War II tuberculous veterans admitted were remaining in the hospital on March 31, 1944.

For the fiscal year ending June 30, 1943, World War II veterans comprised over 20 per cent of the total tuberculosis admissions. Of these younger veterans admitted, 80 per cent were first admissions; 13 per cent were readmissions and 7 per cent were admissions by transfer.

Of the approximately 6,200 tuberculous veterans of all wars and peacetime under treatment in our hospitals on March 31, 1944, over 40 per cent were veterans of World War II. The tuberculosis disability of 37 per cent of these veterans of all wars and peacetime was service-connected, the tuberculosis of the remaining 63 per cent either having been adjudicated as not incurred in service or the decisions on their claims for service-connection were still pending.

The average length of hospital stay of World War II service-connected tuberculous veterans discharged since July 1942, was 109 days. The stay

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**Assistant Medical Director, Veterans' Administration.

in the hospital of non-service-connected tuberculous World War II veterans has increased from 50 days for all discharged from the hospitals since July 1942, to 82 days for those discharged during the month of March 1944.

At one of our hospitals equipped as a chest surgery center, over 70 per cent of the younger beneficiaries of World War II under treatment are receiving surgical collapse therapy. Consequently, we anticipate a considerable increase in our chest surgery program as a result of the admission of new beneficiaries being discharged from the present conflict.

From the nucleus of eight chest surgery centers established in as many geographical areas of the country in 1935, facilities for major thoracic surgery have recently been extended to eight other hospitals. Eventually, it is expected that facilities for major thoracic surgery will be available at all our tuberculosis hospitals and those general hospitals which maintain sizeable departments for the continued treatment of tuberculosis. At the present time, several young full time surgeons are undergoing intensive training in thoracic surgery so that soon further extension of these facilities can be made. It will then no longer be necessary to transfer a patient requiring specialized major chest surgery from certain of our tuberculosis hospitals or tuberculosis departments of general hospitals to another Veterans Administration hospital designated as a chest surgery center, for thoracic surgery when it is determined that such therapy is indicated.

To properly care for psychotic beneficiaries of World War II who are also suffering with active pulmonary tuberculosis, units of approximately 150 beds each are being established at ten neuropsychiatric hospitals. These tuberculosis-neuropsychiatric units are being equipped to render the standard tuberculosis sanatorium regimen in conjunction with the specialized treatment of the concomitant psychosis, and will include the facilities for the simpler forms of collapse therapy. At four of the neuropsychiatric hospitals it is planned to equip and staff the tuberculosis units for utilization as chest surgery centers for tuberculous psychotic male and female patients.

As of March 31, 1942, the Veterans Administration was operating twelve tuberculosis hospitals and tuberculosis departments in twenty-six general hospitals. The total tuberculosis beds on that date were 5,217, of which 3,867 were in tuberculosis hospitals and 1,350 in general hospitals. In addition, 1,427 general medical and surgical beds were being maintained in the twelve tuberculosis hospitals. As tuberculosis beds were required for the veterans of World War II, one general hospital was converted to a tuberculosis hospital and wards for general patients in tuberculosis hospitals were changed to permit utilization for tuberculous patients. Construction changes were also made at several tuberculosis hospitals which resulted in the addition of a number of new beds. Within two years, or by March 31, 1944, the total tuberculosis beds had been increased to 7,196, with 5,326 located in thirteen tuberculosis hospitals and 1,870 in tuberculosis departments of twenty-six general hospitals. By the end of the calendar year 1944 an additional tuberculosis hospital will have been placed in operation, and the aggregate tuberculosis beds will then approximate 8,000.

Tuberculosis in World War II From the Viewpoint of a Radiologist

JOSEPH W. POST, M.D., F.C.C.P.

Philadelphia, Pennsylvania

It is a great privilege to express my viewpoints and I feel deeply honored to be on the same symposium in company with such distinguished guests as appear on the program today.

I do not think that any one will disagree with me that the one outstanding feature, from my specialty, has been the x-ray survey of the chests of men who have enlisted, or been inducted, into the Armed Forces.

This survey would never have been possible without the rapid and economical and practical methods of the paper film, and the photo-fluorographic apparatus utilizing both the 4 x 5 and the 35 mm. films.

In a consideration of these methods of mass survey, I should like to express my sincere appreciation for having had the privilege of experience with all of them.

As an Associate Member of the Medical Advisory Board No. 1, of Philadelphia, for over three years, the first two have been utilized in examining the chests of thousands of inductees and, with the 35 mm. film, it has been my good fortune to observe their worth in association with a Tuberculosis Clinic of Philadelphia.

The smaller films were found to lend themselves more suitably for filing purposes, for the great numbers which would be necessary for inductees.

One cannot look back over the progress of the photofluorograms without noting several outstanding improvements.

The development of the rotating anode x-ray tube has been one of these improvements and by its use, less delays from tube break-downs and by the ability to utilize smaller focal points, for a better detail has been achieved. Similarly greater currents may be used on rotating anodes with resulting increase in contrast.

The next refinement was the advent of the stereoscopic 4" x 10" film and the development of the compact prism stereoscope for rapid viewing.

By reason of the stereoscopic shift, one can view them as flat films and make speed with precision and, if in doubt, they can readily be viewed stereoscopically.

As to facility, in a well regulated Center, myself and partner have reported on as high as 900 in one day, on the small film and, also, the necessary 14" x 17" conventional roentgenograms, which we might consider necessary in doubtful or suspicious cases.

Last, but not least, the shift from a double coated emulsion to the single coated emulsion was a step in the right direction. In the process of bringing the image down to the small size film, the finer linear lung markings were inclined to be made a bit fuzzy on the double emulsion. This objection has almost been entirely eliminated on the single emulsion.

I might mention the Lysholm grid, for heavier patients, but its use has not been routinely adopted in our Station, where the heavy individuals are examined on the 14" x 17" roentgenograms.

It is my opinion that, with these improvements, and the constant increase in experience of technicians, these photofluorograms are absolutely reliable when viewed and interpreted by competent and experienced radiologists.

That statement, naturally, opens up an opportunity for discussion because of the fact that all of the induction Stations may not be in towns or cities where access might be had to experienced radiologists. In our Center in Philadelphia, two men are working daily and they are diplomates of the American Board of Radiology.

We have, furthermore, been fortunate in having a Review Board whose duty it has been to re-screen those cases which have been rejected, throughout the daily routine. This review has the added advantage of a re-study of the films along with pertinent clinical facts.

Anyone accustomed to looking at roentgenograms can detect the moderately advanced, and advanced, cases of tuberculosis, but in all cases whether for the Armed Forces or the Public, our greatest concern is the detection of the early and minimal lesions.

It is not only a question of visualizing and recognizing the tuberculous lesion, but of being able to evaluate those lesions with regard to stability under the rigors of camp life and combat duty.

Minimal standards had to be set up, but after three years of experience combined with many years in civil radiology, I am more than ever convinced that one can not evaluate a tuberculous lesion on a mathematical basis.

By that I mean that calcareous glands in the hilus region cannot be judged by their size in centimeters, and parenchymal calcified nodes cannot be gauged by their numbers in a certain given square centimeter area.

Another standard on which I would comment is that of judging the stability of the tuberculous lesion by comparison of a re-examination made in six months, or even a year hence. The only test of stability is—will the lesion stand up under the rigors of present camp training or combat duty.

These comments are not to be construed as criticisms of those individuals who made them, as it was stated in the foregoing remarks that some minimal standards had to be established.

It is a fact that a minimal percentage of errors in interpretation and judgment will be missed at induction centers, but experience has shown that these mistakes will be picked up during an inductee's early service in training centers.

As evidence of the fact that the practices employed have been of inestimable value is the fact that tuberculosis, which was the chief cause of disabilities leading to discharges in World War I, have dropped to tenth place in causes for Army discharges, last year.

Besides the function of a screening process by means of this vast survey, the small films will serve as records, should a service man, or woman, develop tuberculosis during his, or her, period of active service. This will establish a wealth of data as to the stability of a particular type of lesion.

Furthermore, with the intention of the Armed Forces to re-examine these men and women on discharge, there will accumulate a wealth of data for future study and evaluation.

There is another subject which must be considered in the use of x-ray survey in tuberculosis that has arisen out of this mass study of chests, and that is the public.

Encouraged by the success and the small cost of such practices in the Armed Forces, employees in industrial plants, civilian employees in arsenals, navy yards and civil services, are now being surveyed by the thousands.

Tuberculosis clinics and civil hospitals are adopting the practice of encouraging the public to have their chests examined by this means without cost to them.

A reliable source of information estimates that well over 100,000 persons have had such surveys in and about Philadelphia.

Age groups covering 16 to 80 years are represented.

Where a positive case is discovered, a copy of the findings is directed to the plant medical officer, and a copy is sent on to the City Health Department.

The patient is given the preference of choosing his or her own physician or being treated in one of the City Chest Clinics. It is my privilege to be the Chief of the X-ray Department in a hospital where one of these City Chest Clinics is located, and from personal experience, one can read on the requisition blanks that such cases have been reported positives, or suspicious, on a small film survey.

The greatest number of cases that are picked up are earlier cases, in that only about 8 per cent found are far advanced. After these positives reach a clinic, the clinic in turn, immediately starts an investigation of contacts.

I am happy to state that such a procedure is growing in the practices of private physicians, as evidenced by entire families being checked on by spot films of 14" x 17" size.

The public seems perfectly willing to go to a radiologist for such verification where the small film is positive, or only suspicious.

Philadelphia is fortunate in having a tuberculosis clinic which has, already, two photofluorographic outfits in operation and four additional ones on order, to be delivered by early Fall.

This clinic uses the 35 mm. films and a personal check-up by the conventional 14" x 17" films on hundreds of positives and suspected cases has proven, to me, that it is a reliable method.

As a matter of fact, it is often surprising to see some extremely minimal and early cases which have been interpreted from these 35 mm. roentgenograms.

As a closing thought, it is hoped that following this war, the Federal authorities will put in effect "The Proposed Plan for a United States Military Tuberculosis Commission," as has been outlined by Chas. M. Hendricks, M.D., F.C.C.P., and his co-workers.

Tuberculosis Control in Industry

HERMAN E. HILLEBOE, M.D., F.C.C.P.,* and
DAVID M. GOULD, M.D.**

Washington, D. C.

Tuberculosis is not considered an industrial disease, although in certain dusty trades involving the inhalation of particles of silica there may be a relationship between pulmonary tuberculosis and occupation.

Despite the non-occupational character of pulmonary tuberculosis in general, the peculiar conditions of modern industry have tended to expose workers to more massive and repetitive concentrations of tubercle bacilli than other segments of the population.

Unfavorable social and economic factors such as crowding, at home and in the workshops, and low income are clearly reflected in the tuberculosis mortality data.

Every study of urban housing has shown that tuberculosis death rates in the crowded areas of cities are many times greater than the rates in the less crowded areas; and that industrial workers and their families are concentrated in these areas.

The death rate of tuberculosis (all forms) for males is higher among residents of large cities than among residents of cities of intermediate size. The rate in smaller cities in turn is much higher than that in rural areas. Dublin, in an analysis of Metropolitan Life Insurance records, finds that between the ages of 35 and 44, death rates from pulmonary tuberculosis in industrial male policyholders is about $2\frac{3}{4}$ times that of non-industrial policyholders.

Propagation of the tubercle bacillus finds a fertile soil in cities, where many people live and work in close quarters and even breathe each day a certain number of cubic feet of air shared with other persons. It may well be that the dosage of bacilli plays an important role in the production of clinical tuberculosis; on this basis alone one may expect to find greater opportunities of infection among the people in densely populated areas.

Industrial buildings such as the Ford Bomber Plant at Willow Run and office buildings such as the Pentagon in Washington, are good examples of modern industry's tendency to concentrate ever larger groups of human beings in limited spaces in the pursuit of wage earning. It should also be remembered that approximately one-third of the average adult's life is spent in the task of earning a living.

A lower standard of living appears to be intimately associated with lowered resistance—the second factor in the production of tuberculosis. In a study of tuberculosis mortality among industrial workers by Rollo H. Britten,¹ it was found that the rate among unskilled workers, ages 25 to 44, was four times as high as among professional, business, and clerical workers of the same age group.

High concentrations of tubercle bacilli in the environment and low-

*Medical Director, Tuberculosis Control Division, U. S. Public Health Service, Washington, D. C.

**Surgeon (R), Tuberculosis Control Division, U. S. Public Health Service, Washington, D. C. Now on duty overseas with UNRRA.

ered resistance of the individual can be altered by known methods, such as improvements in community and industrial environments and raising the standard of living. At the present stage of scientific development, there is no practical application of altering the virulence of the tubercle bacilli. However, general improvements in the social and economic status of the country will not, of themselves, reduce or control the spread of tuberculosis in the industrial population. The first task of the physician, whether a general practitioner, a specialist in chest diseases, an industrial physician or a public health officer, is to seek out the human reservoirs of the tuberculous and render them non-infectious.

Fortunately, the industrial environment which favors the spread of tuberculosis also enables the physician to use modern methods in attacking the disease, controlling it, and ultimately eradicating it. The large groups of men and women working under one roof and in the disciplined environment of a modern plant form an ideal medium for mass x-ray surveys for tuberculosis case-finding.

It is known that tuberculosis strikes most frequently among productive workers in the community—men and women between the ages of 20 and 45. Nearly one-half (47%) of all deaths from tuberculosis in this country during the period from 1939 to 1941 occurred in this age group. From early adulthood to age 35, tuberculosis is the leading cause of death. At ages 20 to 34 one in every six deaths among white, and one in every three deaths among non-white persons is due to tuberculosis.

With these facts in mind, the USPHS in 1942 turned to the recently developed photofluorograph x-ray machine for a mass approach to the industrial populations.

From May 1942, to April 1944, over 700,000 individuals had chest x-ray examinations including 576,828 industrial workers. Field units have operated in 17 States, the District of Columbia and Mexico City. Over 200 plants were surveyed. High priorities for surveys were given to Government owned and operated plants, shipyards, air depots, and ports of embarkation. Analysis of 418,608 reports reveals 6,197 persons or 1.5 per cent with evidence of reinfection tuberculosis. Of these 3,970 or 64.1 per cent were in the minimal stage; 1,817 or 29.3 per cent were in the moderately advanced stage; and 410 or 6.6 per cent were in the far advanced stage. It is estimated four in every five positive cases were not known to either private physicians or to official and non-official agencies. Indeed, the majority of patients themselves were completely unaware of a chest disease.

The significance of these findings cannot be emphasized too strongly. Almost 2/3 of the cases are now being brought to light in an early and remediable stage in contrast to the pre-war situation in which only one out of ten patients came to the physician for treatment in the minimal stage. Certainly the implications in these figures are vast. To deal effectively with the increased and changed composition of the current case-load in large industrial communities the present concept of follow-up and treatment must be revised drastically.

Although the 35 mm. film is considered an effective screen, in Public Health Service surveys, each person with x-ray evidence of disease on a small film obtains a conventional 14" x 17" film to corroborate the findings and to furnish more detailed information as to the nature of the lesion.

It is not good practice to report a person with roentgenologic evidence

of tuberculosis, as a case of pulmonary tuberculosis to health authorities, on the basis of the x-ray diagnosis alone. Adequate clinical work-up including history, physical, laboratory tests, and serial roentgenograms is a pre-requisite before a case can be said to have been found. Injustice is done both to the interpreter of the x-ray film and the patient when clinical confirmation of the radiologic presumption is not obtained.

As a valuable by-product of the mass x-ray technique which was designed primarily for tuberculosis case finding, many cases of non-tuberculous pulmonary pathology have been discovered among industrial workers. Numerous persons with cardio-vascular disease, pneumoconiosis, bronchiectasis, tumors, and rare, even bizarre conditions, have been brought to light. An analysis of 422,252 films in U. S. Public Health Service surveys revealed that 4,992 or 1.1 per cent, showed evidence of non-tuberculous chest pathology; 66 different categories of chest lesions were observed.

Because of the large numbers of people in industry the U. S. Public Health Service chose the small film photofluorograph as an efficient and cheap means of screening apparently healthy people into two groups: those with x-ray evidence of chest disease and those with essentially normal chests. The automatic camera is capable of taking 700 chest x-rays in one loading and the ease of processing the films is a decided advantage. Considerably over 100 persons can be x-rayed each hour at a total over-all of approximately 15 cents per film. In addition, 200 to 300 films can be interpreted per hour without undue strain to the reader. Over three quarters of a million films are stored in a small cabinet file 5 feet high, 3 feet wide and 1½ feet deep.

Under certain conditions, 4 x 5 inch films, 14 x 17 inch films, paper films, and fluoroscopy all have their advantages. Controversy as to which is best is futile. The purpose of the program, the extent of the problem, and the availability of personnel and funds must be taken into consideration.

The chest specialist can render a great service to industry and the management of both the tuberculous worker and the worker with non-tuberculous chest disease. He is ideally fitted to give clinical diagnosis, treatment and follow-up for the large numbers of persons disclosed to have lesions. Many industrial physicians lack the time and specialized training for ready handling of workers with chest abnormalities. Both the chest physician and the industrial physician would have much to gain if an organized cooperative plan could be worked out. In certain large industries where such plans exist, results have been eminently satisfactory to all concerned—the employer, the worker, the industrial physician, the radiologist and the specialist in chest diseases.

It is generally agreed that a worker with communicable tuberculosis must be given an employment furlough until he is rendered non-infectious to his fellow worker and to the community at large. The labor unions have recognized this principle, both for the protection of their members and of society.

It is also apparent that the tuberculous worker employed in the dusty trades must be given special protection from the deleterious effects of silica dust. Employment in a dust free atmosphere is essential.

The difficulty arises with the inactive case and the active case which is regressive. Some employers and even some industrial physicians take

the attitude that any worker with tuberculosis should be discharged. Such wholesale termination of employment, is not only unfair but shows a lack of understanding as to the nature of tuberculosis. A great deal of education is necessary to demonstrate that workers with inactive pulmonary tuberculosis may be employed safely, if they are properly placed and given medical supervision.

Today, under the stress of war and depleted manpower, many industries have gone to the other extreme of employing tuberculous men and women who for their own sakes as well as that of their fellow workers should not be employed. Here too education of management, labor, and the public is an essential phase of tuberculosis control in industry.

If modern control methods are to function fully for the benefit of industry, labor and the health of the nation, fair and liberal employment policy must be worked out between management and labor, before mass chest x-ray surveys, preplacement chest x-rays, and periodic x-ray examinations are undertaken.

Mass application of the photofluorographic technique opens an unparalleled opportunity to control tuberculosis among the 50,000,000 workers and their families of the United States. The x-ray points out the infected pool; the follow-up and treatment must be geared to keep in step with the newer methods of case-finding. Just as the tubercle bacillus has been practically eliminated from cattle, it now lies within the realm of possibility to eliminate the tubercle bacillus from human society.

REFERENCE

- 1 Britten, Rollo H.: "Mortality Rates by Occupational Class in the United States," *Reprint 1648 from Public Health Reports*, 49: 9, Sept. 21, 1934.

Discussion of Papers

COLONEL ESMOND R. LONG, M.C.
Washington, D. C.

The papers presented at this symposium furnish a comprehensive picture of the campaign against tuberculosis in the total war effort. Time permits singling out but a few items for further discussion.

General Marietta has pointed out the lessons of the first world war and the advantages the present program has gained from the shortcomings of 25 years ago. These center on better means of excluding from the armed forces persons who have active tuberculosis or latent tuberculosis which might become activated under the conditions of military service. The effectiveness of the screening at Army induction stations, which place almost sole reliance on chest x-ray examination for the detection of tuberculosis, is measured in part by the Army hospital admission rate for tuberculosis. This rate has averaged approximately one tenth of that of World War I and has declined steadily within the course of this war from a peak of 1.8 men per thousand per year in 1941 to 1.2 in 1943 and 0.9 for the first five months of 1944.

However, it must not be forgotten that the Army is much larger than in 1918 and the war is lasting much longer. So the total number of cases to be expected in this war is not so far short of that in World War I as might be expected from the compared rates.

The Navy has established an enviable record, as clearly shown by Captain Duncan's report on the Navy program. With the Navy's adoption of a screening program for removal of existing cases as well as exclusion of cases in men applying for service, the rate has dropped below the low rate reached by the Army. The plan for periodic re-screening of Navy personnel is admirable, and it is to be hoped it can be put into active operation in the near future. As Captain Duncan has pointed out, such a study of Navy personnel is especially needed because of the close crowding on ships and corresponding ease of transmission of disease from open cases. The periodic return of ships to land bases facilitates screening in a way not possible in the Army. A noteworthy feature of both programs, sure to be of value to the general anti-tuberculosis campaign, is the requirement that chest x-ray films be made at the time of discharge from military service.

The Canadian record is one of which the control officers should be very proud. The lessons of World War I were taken to heart in Canada, and measures were put into effect in a sound and practical manner. Mobilization proceeded without undue haste and the mistakes inevitable in programs of less individualized character, more subject to periods of stress and strain, were avoided. In his discussion, Colonel Adamson has raised certain basic questions of great scientific importance. It is to be expected that in this age, when large numbers of previously uninfected men are being inducted, an appreciable amount of primary tuberculosis will occur. Whether such tuberculosis is of greater or less severity than reinfection type tuberculosis is debatable, but its relation to pleurisy with effusion makes it of special clinical importance.

Veterans' problems have received much publicity in recent months. That a large proportion of the tuberculous veterans of World War I failed to stay under hospital control long enough to achieve arrest of their disease is lamentably true, and the fact that World War II tuberculous veterans display the same tendency to forego adequate treatment is disquieting. However, it appears clear from Colonel Wolford's description that an increasingly effective program is under way to counteract this tendency, and that its results are already evident in a lessened rate of leave against medical advice from veterans' facilities. It is apt to be overlooked that the Veterans Administration cannot make its program effective without the support of outside agencies. The Veterans Administration must work under the regulations set, and if the latter are such that there is financial incentive for veterans to stay away from veterans' hospitals, the medical service set up for veterans cannot be charged with the failure of medical success. It is quite evident that a program of education is needed which will, on the one hand, induce legislators to shape governing legislation in such a way as to provide incentive for veterans to stay in hospitals, and, on the other hand, force the veterans themselves to realize the necessity of adequate care for their own and their families' sakes.

The U. S. Public Health Service has done a notably fine job in meeting the new conditions created by the war. As Dr. Hilleboe has pointed out, in the paper presented by Captain Gould, concentration of workers

in intensified national industry and the migrations attendant upon the increased demands for labor in certain industrial centers, have magnified old problems and raised new ones. The rapid case finding surveys set up in industrial plants by the Public Health Service have been instrumental in discovering thousands of cases of tuberculosis at a time when restoration to health is probable and avoidance of dissemination of disease assured. It may be pointed out in this connection that the States Relations Division of the U. S. Public Health Service has played an effective part in facilitating proper reporting of cases of tuberculosis discovered at armed forces induction stations.

Dr. Post has given us a timely review of the merits of the different types of films. It appears true that all of the rapid x-ray methods have served a useful purpose in the discovery of cases of tuberculosis of every grade of severity. It is to be pointed out in this connection that substantial improvement has been made in films within the period of this war. The stereoscopic 4 x 5 inch photoroentgenograms made today in the Army, for example, are far superior to the films made in the early days of mobilization in 1941 and the first part of 1942.

I wish there were time to discuss Dr. Post's remarks relative to the physical standards followed in acceptance or rejection of men with different degrees of arrested tuberculosis. I can only say that these standards were practical for the period when they were used. The latest edition of mobilization regulations leaves more latitude in judgment to the examiner, and at the same time places increased emphasis on the potential danger of early tuberculous lesions of infiltrative type, insisting on qualitative evidence of thorough scarring as well as a time interval to ensure stability.

In conclusion it may be said that the intensity of the general case finding campaign incident to the war effort, in connection with military service and industrial employment, will go far in discovering sources of contagion in our population and yield results of great value if proper follow-up and care of cases can be maintained. There is no question that the anti-tuberculosis workers of this country are alive to this fact and that every effort will be made to take advantage of the opportunity.

The Symposium on Tuberculosis in World War II, published in the preceeding pages was arranged by the Council on Military Affairs and Public Health, American College of Chest Physicians and presented at the Tenth Annual Meeting of the College, Chicago, Illinois, June 11, 1944.

Tuberculosis Mortality*

Death Rate for Tuberculosis (all forms), By Race and Sex: 1923-1943 (Rates per 100,000 population)

YEAR	Total	WHITE			NONWHITE		
		Total	Male	Female	Total	Male	Female
1943.....	42.6	34.3	44.4	24.7	112.9	126.4	100.0
1942.....	43.1	34.4	43.3	25.6	118.4	131.4	106.0
1941.....	44.5	35.4	43.3	27.4	124.2	134.3	114.5
1940.....	45.8	36.5	44.7	28.2	127.6	138.7	116.9
1939.....	47.1	37.7	44.7	30.6	129.1	137.3	121.1
1938.....	49.1	39.1	46.2	31.9	136.8	144.0	129.8
1937.....	53.8	43.4	50.9	35.8	145.0	155.0	135.2
1936.....	55.9	45.0	52.2	37.6	151.6	163.9	139.6
1935.....	55.1	44.9	51.7	37.8	145.1	155.4	135.0
1934.....	56.7	46.2	52.7	39.6	148.8	156.9	140.8
1933.....	59.6	48.5	54.3	42.6	157.7	165.6	149.9
1932.....	62.5	50.2	55.9	44.4	173.5	179.5	167.5
1931.....	67.8	54.2	60.1	48.2	191.1	197.4	184.9
1930.....	71.1	57.7	63.4	51.9	192.0	194.3	189.8
1929.....	75.3	62.4	67.1	57.6	192.0	191.5	192.6
1928.....	78.3	64.9	69.7	59.9	199.5	199.4	199.6
1927.....	79.6	66.5	70.7	62.2	208.7	205.4	212.1
1926.....	85.5	72.0	78.4	67.5	223.8	221.5	226.1
1925.....	84.8	71.6	75.8	67.2	221.3	215.8	226.7
1924.....	87.9	74.9	79.3	70.4	218.6	215.0	222.3
1923.....	91.7	79.5	84.4	74.5	213.1	206.3	220.0

*Vital Statistics, Special Reports, National Summaries, Vol. 21, No. 2, April 10, 1945, Department of Commerce, Bureau of the Census, Washington, D. C.

An Analysis of Tuberculosis Mortality in the United States for 1943*

The chart on the opposite page includes mortality figures for tuberculosis (all forms) for the past 20 years. We are presenting herewith a summary of the report on tuberculosis mortality in the United States in 1943 as compiled by I. M. Moriyama, Vital Statistics Division, Bureau of Census and J. Yerushalmy, Tuberculosis Control Division, U. S. Public Health Service.

The number of deaths reported from tuberculosis (all forms) in 1943 was 57,005, the death rate being 42.6 per 100,000 estimated population. The rates for white females and for nonwhites of both sexes continued to decline while that for white males showed little change.

Death rates for tuberculosis (all forms) are higher in the older age groups than in the younger. Among children and young adults, the rates are higher for females than for males. In the older age groups, the rates are much higher for males. A decrease in the rates for the nonwhites and for white females occurred in nearly all age groups. In most instances the rate for white males 45 years and over is slightly higher than in previous years.

The ratio of tuberculosis deaths to deaths from all causes continued to decline. The reduction occurred in nearly all age, race, and sex groups, except among the nonwhites from about 15 to 34 years and white males 45 years and over.

The tuberculosis death rate for individual States ranged from 11.2 for Utah to 98.2 per 100,000 population for Arizona. The reduction in rate was widespread and occurred in one-half of the States. Decreases of more than 10 per cent in the rate were reported for Delaware, Kansas, Utah, Arizona, Oregon, Mississippi, Virginia, South Carolina, and Florida.

Increases of more than 10 per cent in the rate were reported for five States, New Hampshire, Nebraska, New Mexico, Massachusetts, and Vermont. The largest increase (39.8 per cent) was for New Hampshire. Smaller but consistent increases in rate occurred among residents of New York and Rhode Island.

The ratio of tuberculosis deaths occurring in a State in 1943 to the number of tuberculosis deaths of residents in that State showed little variation from previous years.

With the exception of a few States, nearly 92 per cent of the tuberculosis deaths occurring in 1943 were from tuberculosis of the respiratory system. The proportion of nonrespiratory tuberculosis varied from 5.3 per cent for residents of Texas to 18.9 per cent for residents of Wyoming.

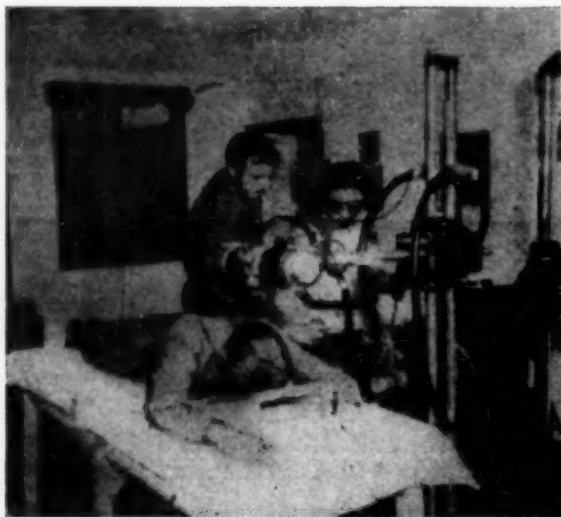
Of the 52,407 deaths from respiratory tuberculosis in 1943, 32,541 or 62.1 per cent occurred in institutions; 12,544 or 23.9 per cent in general hospitals; 14,568 or 27.8 per cent in tuberculosis hospitals; 4,098 or 7.8 per cent in nervous and mental institutions; and 1,331 or 2.5 per cent in other institutions. There has been a consistent increase in the number and percentage of tuberculosis deaths in institutions, and a decrease in the number and percentage of deaths that occurred in the home. An increase in the institutional deaths occurred in those under Federal, State, and county-city control.

*Vital Statistics, Special Reports, National Summaries, Vol. 21, No. 2, April 10, 1945: Department of Commerce, Bureau of the Census, Washington, D. C.

College Fellow Devises Plan to Train Chinese Medical Students in Station Hospital



Major James Tobin, M.C., Elgin, Illinois, conducting a class in surgery. Looking on are internes, Hsu Pai Jung and Chin Wu.



Sgt. Lamar R. Stah, Fort Madison, Iowa, demonstrates the use of modern x-ray equipment to interne Chou Tsu Jeu.



Interne Chin Wu getting a few pointers in the use of the stethoscope from Captain Edward Dorian, M.C., New Britain, Conn.

Col. Leonidoff
Inaugurates Novel Plan
for Training Chinese
Medical Students



Col. A. A. Leonidoff, M.C.
Poughkeepsie, New York

Colonel A. A. Leonidoff, F.C.C.P., Poughkeepsie, New York, commanding officer of a Station Hospital situated in China, inaugurated a plan to enroll senior Chinese medical students as internes in an American Hospital. On January 15th, the first group of eighteen internes was admitted. They are being billeted and fed by the U. S. Army. They eat in the enlisted men's mess and are under the same military discipline as hospital G I's. Their only distinction is the badge that they wear on the left side of their blouses bearing their names in English and the words: "Station Hospital, U. S. Army."

Major General L. P. Chin who is reorganizing the Chinese Medical College at Kunming, was so impressed by the American methods and equipment that he requested his charges be allowed to remain at the American hospital for the purpose of completing their training. General Chin and Colonel Leonidoff with D. W. Mainzer, a professor of the Second Army Medical College of the Chinese Ministry of War, are co-operating in this plan which is unprecedented in the history of the U. S. Army Medical Corps. It is an outstanding example of Sino-American cooperation.

Colonel Leonidoff said, "The boys seem very happy here. They are smart, eager to learn, and I am sure that they will make first-rate doctors. We are proud of our plan, and we think that it is an example of what real cooperation can accomplish when it is given a trial."

Colonel Leonidoff, upon his arrival in China, was assigned as Medical Advisor to the Chinese troops. For his work with this command he received the Bronze Star, and the Certificate of Distinguished Service from Generallissimo Chiang Kai-Shek, as well as the "Spirit of Cooperation" Medal from a Chinese Artillery Unit.

College News

COLLEGE OFFICIALS TO MEET AT CHICAGO

The Executive Council of the American College of Chest Physicians will meet at Chicago, Illinois, June 16, 1945. The Board of Regents of the College will meet at the Palmer House, Chicago, Illinois, June 17, 1945.

BOARD OF EXAMINERS

The next written examination for Fellowship in the American College of Chest Physicians will be held at Chicago, Illinois, on June 16, 1945. Candidates who plan on taking the written examination should communicate with the Executive Secretary of the College, 500 North Dearborn Street, Chicago 10, Illinois.

NEW APPOINTMENTS

Dr. Jay Arthur Myers, F.C.C.P., President of the American College of Chest Physicians, announces the appointment of the following College officials:

Amadeo V. Mastellari, M.D., F.C.C.P., Panama City, Republic of Panama, Regent pro tem for Central America.

Raul Blanco Cervantes, M.D., F.C.C.P., San Jose, Governor for Costa Rica.

Alberto Di Nepi, M.D., F.C.C.P., Guatemala City, Governor for Guatemala.

Juan M. Moscoso, M.D., F.C.C.P., Trujillo, Governor for the Dominican Republic.

Louis Roy, M.D., F.C.C.P., Port-au-Prince, Governor for Haiti.

NAVY ESTABLISHES EASTERN TUBERCULOSIS CENTER

The Sampson Naval Hospital has been selected by the Bureau of Medicine and Surgery, U. S. Navy, as the site of the Eastern Tuberculosis Center for the treatment of all active tuberculosis cases on the Navy's Register east of the Mississippi River. The Western Center is situated at Corona, California.

Lt. Comdr. Jacob F. Heinrich, F.C.C.P., Jackson Heights, New York, has been placed in charge of this new tuberculosis center. The center will have its own surgical unit, and all facilities for the care and treatment of the tuberculous will be available at the hospital.

Also on the staff are: Comdr. Roy M. Mayme, F.C.C.P., Duluth, Minnesota; Lt. Comdr. W. C. Jensen, F.C.C.P., Utica, New York, and Lt. Comdr. William Newcomer, F.C.C.P., Towson, Maryland.

Dr. Shu Fan-Li, F.C.C.P., Hong Kong, China, Governor of the American College of Chest Physicians for China, is attending the San Francisco Conference as an Advisor to the Chinese Delegation.

Captain Jack Reiss, formerly of Indianapolis and at present attached to the 326th Medical Company of the 101st Division, was awarded the Bronze Star and a Presidential Unit Citation with Oak Leaf Cluster for conspicuous action in the defense of Bastogne on Christmas Day, 1944. Captain Reiss, the only member of his medical company stationed in the city during its siege, supervised the treatment and care of the wounded. Captain Reiss was home on a short leave but has since returned to overseas duty. He is an Associate Fellow of the American College of Chest Physicians.

Lt. Col. Leo V. Schneider, F.C.C.P., Washington, D. C., has been made Chief of Industrial Medicine, New York Port of Embarkation. He recently published an article on "Problem Cases in an Army Industrial Installation" in *Military Surgeon*, January 1945 issue. Under the supervision of Colonel Schneider a chest x-ray survey has been completed for the entire metropolitan area of the New York Port of Embarkation.

College Chapter News

INDIANA CHAPTER

The Indiana Chapter of the American College of Chest Physicians met at the Columbia Club, Indianapolis, Indiana, March 18, 1945. The following scientific program was presented:

"Survey of Rejectees from the Army because of Tuberculosis,"

T. A. Woodson, M.D., F.C.C.P., Waverly Hills, Kentucky.

"Survey of Rejectees from the Army because of Non-Tuberculous Lung Lesions," D. W. Brodie, M.D., F.C.C.P., Indianapolis, Indiana.

"Tuberculous Pneumonia,"

J. W. Strayer, M.D., F.C.C.P., Lafayette, Indiana.

X-Ray Conference.

The following resolutions were adopted by the members of the Indiana Chapter at this meeting:

1. The Indiana Chapter of the American College of Chest Physicians goes on record as supporting the establishment of a Board of Diseases of the Chest to replace the sub-specialty of Tuberculosis of the Board of Internal Medicine.
2. The Indiana Chapter of the American College of Chest Physicians approves of the mass chest x-ray surveys being conducted under the auspices of the Indiana State Tuberculosis Association and recommends that these surveys be continued.

Dr. Phillip H. Becker, F.C.C.P., Crown Point, President of the Indiana Chapter, announces the following committee appointments:

Membership Committee:

Robert B. Sanderson, M.D., F.C.C.P., South Bend, *Chairman*

William G. Crawford, M.D., F.C.C.P., Terre Haute

Thomas R. Owens, M.D., F.C.C.P., Muncie

Program Committee:

James H. Stygall, M.D., F.C.C.P., Indianapolis, *Chairman*

John V. Thompson, M.D., F.C.C.P., Indianapolis

James F. Spigler, M.D., F.C.C.P., Terre Haute

Medical Education Committee:

Joseph W. Strayer, M.D., F.C.C.P., Lafayette, *Chairman*

Paul D. Crimm, M.D., F.C.C.P., Evansville

Sidney W. Wolpaw, M.D., F.C.C.P., Indianapolis

ILLINOIS CHAPTER

The Illinois Chapter of the American College of Chest Physicians met jointly with the Chicago Tuberculosis Society, and the Illinois Trudeau Society at the Bismarck Hotel, Chicago, Illinois, April 5th. The following scientific program was presented:

"Chest Injuries," Captain David J. Dugan, M.C., U.S.A.,
Walter Reed General Hospital, Washington, D. C.

"Therapeutic Results with Sulphone Compounds (Including Diasone)
In Clinical Tuberculosis," Henry C. Sweany, M.D., Chicago, Illinois.

At a special meeting of the members of the Illinois Chapter of the College held immediately after the scientific program, the following resolution was adopted:

The Illinois Chapter of the American College of Chest Physicians at a special meeting held at the Bismarck Hotel, Chicago, Illinois, April 5, 1945, recommends to the Board of Regents of the College that steps be taken to establish at an early date the American Board of Diseases of the Chest.

Such a Board should, if possible, be organized in conformity with the rules established by the Advisory Board for Medical Specialties, and Council on Medical Education of the American Medical Association.

It is the consensus of opinion of the members of the Illinois Chapter of the College that the present Sub-Board of Tuberculosis is inadequate and that it does not give proper recognition to the physicians who are qualified chest specialists.

The Secretary of the Illinois Chapter of the College is hereby authorized to send a copy of this resolution to the Executive Secretary of the American College of Chest Physicians and it is to be presented to the Board of Regents of the College at their next annual meeting.

NEW YORK STATE CHAPTER

At the mid-winter meeting of the New York State Chapter of the American College of Chest Physicians, held at the Biltmore Hotel, New York City, February 2, 1945, the following resolution was introduced and adopted:

1. Whereas the field of medical endeavor comprehended by the term "chest diseases" is a well defined specialty, and
2. Whereas the exploitation of this field requires particular training and exercise of a number of specialized methods and practices, and
3. Whereas the chest specialist is greatly handicapped by not having the unrestricted freedom in his field which is enjoyed by other specialties, and
4. Whereas equal difficulty is now being experienced from the same cause in the training of the rising generation of chest specialists, and
5. Whereas, due to the lack of properly trained specialists, general hospitals, are, for the most part, left with inadequate or no service at all in the field of chest diseases, and
6. Whereas part of these difficulties is perpetuated by the fact that the specialty of chest diseases has not been officially recognized as such,

Therefore, be it resolved that this body, in official session assembled, place itself on record as in favor of the following:

1. Recognition of "chest diseases" as a specialty by the American Board for Medical Specialties.

2. Freedom of the chest specialist to practise and explore all methods of diagnosis and treatment within his province which will contribute to the patient's welfare.
3. The right of all internes, residents, and practitioners in special chest hospitals or chest services to receive instruction in all methods of diagnosis and treatment of chest diseases for which they are qualified by ability and previous training.
4. The appraisal of all properly interested bodies of the content of this resolution, urging that they use their influence to secure its adoption with the least possible delay.

PACIFIC NORTHWEST STATES CHAPTER

Dr. James M. Odell, F.C.C.P., The Dalles, Oregon, President of the Pacific Northwest States Chapter of the College, announces the following committee appointments:

Membership Committee:

John Fred Steele, M.D., F.C.C.P., Tacoma, Washington, *Chairman*
Kenneth A. Tyler, M.D., F.C.C.P., Deer Lodge, Montana
James M. Pomeroy, M.D., Portland, Oregon.

Program Committee:

William S. Conklin, M.D., F.C.C.P., Portland, Oregon, *Chairman*
John Ernest Nelson, M.D., F.C.C.P., Seattle, Washington
Frank L. Terrill, M.D., F.C.C.P., Deer Lodge, Montana

Public Relations Committee:

Frederick Slyfield, M.D., F.C.C.P., Seattle, Washington, *Chairman*
Ralph C. Matson, M.D., F.C.C.P., Portland, Oregon
Frank L. Terrill, M.D., F.C.C.P., Deer Lodge, Montana
Irvin R. Fox, M.D., F.C.C.P., Eugene, Oregon

Nominating Committee:

Howard L. Hull, M.D., F.C.C.P., Yakima, Washington, *Chairman*
Byron F. Francis, M.D., F.C.C.P., Seattle, Washington
Kenneth A. Tyler, M.D., F.C.C.P., Deer Lodge, Montana

CHAPTER MEETINGS CANCELLED

California Chapter, Seymour M. Farber, M.D., F.C.C.P., San Francisco, Secretary-Treasurer.

Georgia Chapter, Julius C. Burch, M.D., F.C.C.P., Atlanta, Secretary-Treasurer.

Missouri Chapter, William W. Buckingham, M.D., F.C.C.P., Kansas City, Secretary-Treasurer.

North Midwest Chapter, Karl F. Pfuetze, M.D., F.C.C.P., Cannon Falls, Minnesota, Secretary-Treasurer.

Ohio Chapter, Elmer E. Kirkwood, M.D., F.C.C.P., Youngstown, Secretary-Treasurer.

Texas Chapter, Elliott Mendenhall, M.D., F.C.C.P., Dallas, Secretary-Treasurer.

College News Notes

Dr. Antonio Navarrete, F.C.C.P., Havana, Cuba, Regent of the College, has been appointed a member of the Consejo Superior de Tuberculosis, the Governing Board of the National Council of Tuberculosis for Cuba.

Dr. Robert A. Peers, F.C.C.P., Colfax, California, was recently elected a director of the American Medical Association to succeed the late Dr. E. M. Palette of Los Angeles.

Dr. Irving Willner, F.C.C.P., Newark, New Jersey, Vice-President of the New Jersey Chapter of the College, was recently appointed Director of the Division of Tuberculosis of the City of Newark. Dr. Willner has also received an appointment as Acting Chief of Staff at the Tuberculosis Service of the Newark City Hospital and as consultant at the Essex Mountain Sanatorium, Verona, New Jersey.

Dr. Herbert L. Mantz, F.C.C.P., Kansas City, Missouri, was recently elected Vice-President of the staff officers of the St. Mary's Hospital in that city. Dr. Mantz is the Governor of the College for the State of Missouri.

Dr. Milton S. Lloyd, F.C.C.P., Staten Island, New York, was elected President of the Richmond County Medical Society.

Dr. Joseph Moody, Associate Member of the American College of Chest Physicians, was appointed Assistant Medical Director of the Franklin County Tuberculosis Hospital, Columbus, Ohio.

Dr. George G. Ornstein, F.C.C.P., New York City, presented a paper entitled, "Chest Diseases as an Army Problem" at the Wartime Graduate Medical Meeting, February 19th at the Tilton General Hospital, Fort Dix, New Jersey.

Dr. William F. Reinhoff, Jr., Baltimore, Maryland, presented a paper "Clinic in General Surgery," at the Wartime Graduate Medical Meeting held April 2nd at the Newton D. Baker General Hospital, Martinsburg, West Virginia.

Dr. Paul H. Holinger, F.C.C.P., Chicago, Illinois, and Dr. Robert G. Bloch, Chicago, Illinois, presented a paper entitled, "Chest Diseases and Diseases of the Larynx" at the Wartime Graduate Medical Meeting, held April 25th, at the Station Hospital, Camp Ellis, Lewiston, Illinois.

Dr. H. I. Spector, F.C.C.P., St. Louis, Missouri, Regent of the American College of Chest Physicians, addressed the Green County Medical Society at Springfield, Missouri, on March 23rd.

Dr. Louis H. Clerf, F.C.C.P., Philadelphia, Pennsylvania, presented a paper entitled, "The Esophagus and Its Diseases" at the Wartime Graduate Medical Meeting, on February 23rd, at the U. S. Naval Hospital, Philadelphia.

Dr. Myron D. Miller, F.C.C.P., Columbus, Ohio, presented a paper entitled, "Pulmonary Tuberculosis and Its Complications" on April 19th at the Station Hospital, Lockbourne Army Air Base at Columbus.

Lt. Biagio Battaglia (MC) USNR, F.C.C.P., published a paper, "Treatment of Empyema" in the April 1945 issue of the "United States Naval Medical Bulletin."

Dr. Sydney Bassin, F.C.C.P., New York City, presented a talk on "The Treatment of Pulmonary Tuberculosis" before the Mount Vernon Medical Society held on January 11th, at the Knolls, Mount Vernon, New York.

Dr. Edward W. Hayes, F.C.C.P., Monrovia, California, has been instrumental in organizing and presenting a number of programs at Orange and Imperial Counties, California. The programs consist of brief talks concerning the cause, prevention, diagnosis and treatment of tuberculosis. This is followed by a series of x-ray films illustrating mechanical therapy and then a series of cases is presented by the medical staff. Each of the films is discussed and in many instances the patients, some of whom have been discharged from the sanatoria, are presented. These programs are attended by both the medical profession and the laity.

Dr. A. Rodriguez Diaz, Havana, Cuba, has been elected a Fellow of the American College of Chest Physicians.

BOOKS AND REPRINTS RECEIVED

Bound issue, "Papers and Prize Essays," from the Rose Lampert Graff Foundation, Dr. Jacob Jesse Singer, F.C.C.P., Los Angeles, California, Director.

"Primera Conferencia Nacional de Tuberculosis," from Dr. Caño Girona, Lima, Peru.

"Anales de la Catedra de Patologia y Clinica de la Tuberculosis," from Dr. Raul F. Vaccarezza, F.C.C.P., Buenos Aires, Argentina.

"Demonstration of Hidden Apical Chest Lesions" (reprint), from Captain H. E. Bass, (MC), AUS, F.C.C.P., and Major Samuel I. Kooperstein, (MC), AUS.

"Coccidioidomycosis and Tuberculosis—A Diagnostic Problem," from Captain H. E. Bass, (MC), AUS, F.C.C.P.

Note: Members of the College are urged to send copies of reprints of articles published in journals other than *Diseases of the Chest*, books and other manuscripts to the library of the American College of Chest Physicians, Chicago 10, Illinois. Receipt of reprints, books, articles, and manuscripts will be acknowledged in the College journal, *Diseases of the Chest*.

Obituaries

ISAAC JAMES ARCHER

1862 - 1945

Dr. Archer was born in Henderson County, Illinois, October 28, 1862. He attended the country school; Hedding College, Abingdon, Illinois; Simpson College, Indianola, Iowa; and Northwestern University, where he took his M.D. degree in 1892. He started practice at Berwyn, Illinois, a suburb of Chicago, specializing as insurance examiner, becoming Assistant Supreme Medical Examiner of the Royal League, a fraternal insurance organization with headquarters in Chicago, a title that he held until his retirement three years ago. After a few years of private practice he organized, built, and began the management of the Royal League Sanatorium at Black Mountain, N. C., in 1904. This was the first tuberculosis sanatorium to be established by a fraternal insurance corporation in America. He also founded the Cragmont Sanatorium, a private institution.

Dr. Archer was prominent in the affairs of the Presbytery and a member of the Mountain Retreat Association which directs the summer conferences of the Presbyterian Church of the United States, and a director of Montreat College. For a number of years he was President of the Black Mountain Chamber of Commerce.

In addition to his Fellowship in the College he was a member of the National Tuberculosis Association, an Honorary Member of the Buncombe County Medical Society and a Fellow of the American Medical Association. His son, Dr. Vincent W. Archer, is professor of Roentgenology at the University of Virginia.

Karl Schaffle, M.D., F.C.C.P.
Regent

HAROLD F. PARKER

1882 - 1945

Dr. Harold F. Parker, Clinical Director of the Veterans Administration Facility, Waukesha, Wisconsin, died as a result of hypostatic pneumonia, following a cerebral hemorrhage, January 13, 1945. He was removed to the Veterans Administration Facility at Wood, Wisconsin, following his initial illness, January 3, 1945.

Dr. Parker was a native of Manchester, New Hampshire and graduated from Tufts Medical College in 1909. He engaged in private practice in Boston, Massachusetts from 1912-1916. During World War I, Dr. Parker served as Captain in the United States Army. He took part in the battles of the Marne, St. Mihiel and Meuse-Argonne, as a member of the 103rd Field Hospital, 101st Ambulance Company and 104th Infantry Unit. Wounded in action, he was awarded the Purple Heart.

He entered the U. S. Public Health Service as Passed Assistant Surgeon (Reserve) in November 1919 and served continuously with the U. S. Public Health Service, Veterans Bureau and its successor, the Veterans Administration, until the date of his death.

His tuberculosis training began in 1910 with postgraduate training in

the Massachusetts State Tuberculosis Sanatorium. He was a Fellow in the American College of Chest Physicians.

Dr. Parker leaves his wife, Mrs. Helen Parker; his mother, Mrs. Sarah Parker; a brother and two sisters. He was buried in Arlington National Cemetery, Virginia.

Colonel Roy A. Wolford, F.C.C.P.
Governor, Veterans Administration

HUGH FAY RINGO

1884 - 1945

Dr. H. F. Ringo died suddenly of coronary thrombosis on February 6, 1945. He was born in Bath County, Kentucky, July 7, 1884. He completed his medical education and was graduated from the University of Louisville in 1907. He was engaged in the practice of medicine as an industrial physician for the Montreal Mining Company in northern Wisconsin from 1909 until 1923, and as chief medical examiner for the study of silicosis for the same company from 1923 until 1936.

In 1936 he retired from his practice and devoted his activities to the further study of industrial diseases of the lungs. He was associated with the Wisconsin Anti-Tuberculosis Association from 1942 until the time of his death. Dr. Ringo was a member of the committee for the prevention of silicosis through medical control, a project of the U. S. Labor Board; was a member of his county and state medical societies, as well as a Fellow of the American Medical Association and the American College of Chest Physicians.

Love of hard work was one of his virtues. His kind and gentle manner won for him the affection and friendship of all of his associates. When disease forced him to abandon the routine practice of medicine, he made the most remarkable adjustment to the handicaps of ill health. He retained his interest in medicine and in medical problems up until the time of his death. His passing away is a great loss to the College.

Carl O. Schaefer, M.D., F.C.C.P.
Governor for Wisconsin

Book Reviews

Synopsis of Diseases of the Heart and Arteries. By George R. Herrmann, M.S., M.D., Ph.D., F.A.C.P. Professor of Medicine, University of Texas, etc. Third Edition with 103 Text Illustrations and 4 color plates. 516 pp. \$5.00. The C. V. Mosby Co., St Louis, 1944.

This book is a concise presentation of present knowledge of heart and artery diseases. It is organized in a logical and orderly manner, beginning with symptoms and diagnosis of heart disease, methods of patient study and examination, and continuing with a discussion of the different etiological types of heart disease and related clinical syndromes. Recent developments in Electrocardiography and Cardiology as related to Military Medicine are included in this edition. Controversial subjects are largely avoided and only well accepted concepts are expressed.

The author has stated that his purpose is to write a text and reference

for students and general practitioners who do not have time to read extended discussions of the various phases of Cardiology. Unquestionably, he has succeeded, and the book is to be highly recommended for this purpose. Even those who have spent considerable time in the study of cardiovascular diseases may read the book with profit.

Charles N. Holman, M.D.

Artificial Pneumothorax in Pulmonary Tuberculosis Including Its Relationship to the Broader Aspects of Collapse Therapy. By T. N. Rafferty, M.D., with Introduction by Henry Stuart Willis, M.D., 192 pages, 14 Tables, 26 Illustrations. First Edition, 1944. Price: \$4.00. Grune & Stratton, New York.

This is a book having a definite, limited purpose which can best be appreciated after reading the author's foreword and Dr. Willis' introduction.

The author holds the view that much of the use of pneumothorax in the past has been *misuse* due to lack of definition of the therapeutic objective and to gauging success by early rather than late results. His purpose, therefore, is to set forth certain principles which are believed to be vital to the proper application of pneumothorax and which seem never to have been clearly established or adequately emphasized. Individualization of treatment must be qualified by these principles, and compromise recognized as such; otherwise it becomes a matter of personal opinion or prejudice rather than judgment.

The author comments on the development of a rational program of collapse therapy, on the place of laboratory data and roentgenograms in the management of tuberculosis, and on the present status of individual collapse measures, including their indications.

The greater portion of the book deals with case selection and management. The commonly accepted indications and contraindications for pneumothorax are given, also a thorough analysis of the controversial subjects of primary thoracoplasty and treatment of the minimal lesion. Bronchial tuberculosis is discussed in all its aspects because of its important effect on the results of pneumothorax.

The dangers of maintaining an ineffectual pneumothorax and the importance of pneumonolysis are stressed, and closed intrapleural pneumonolysis is discussed at length. Considerable attention is given also to the nature and management of tension cavities and to the causes, prevention and treatment of empyema.

In emphasizing basic principles which make for optimal long-term results in this field, Dr. Rafferty offers the objective basis on which, with common sense, clinical judgment and perspective are built. A careful reading of his book will enable many physicians to estimate more accurately the degree of success offered by various collapse procedures in the individual case, and to judge better the results of their own work.

Florence A. Brown, M.D.
